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JONES (E. W.). **Biological flora of the British Isles. Acer L.**—*J. Ecol.*, xxxii, 2, pp. 215–252, 1 pl., 2 figs., 2 graphs, 2 maps, 1945.

Most of the fungi associated with *Acer* in the British Isles are saprophytes, but considerable damage may at times be inflicted on *A. pseudoplatanus* by *Uncinula aceris* and *Rhytisma acerinum*, the last-named being almost ubiquitous on sycamores except in the smoky atmosphere of large manufacturing cities. *U. aceris* is more prevalent than *R. acerinum* on *A. campestre*. Other organisms not confined to *Acer* but injurious to representatives of the genus include *Polyporus squamosus*, the agent of sycamore heart rot, *Phytophthora cactorum* [*R.A.M.*, xx, p. 326], causing the death of seedlings, and (on badly pruned street trees only) *Nectria cinnabarina*.

WOJTYLKO (E.). **Das Fichtensterben durch Hallimasch im Bereich der Forstverwaltung Rzyki der Herrschaft Saybusch O.-S. Nach dem Stand vom Frühjahr 1942.** [The dying-off of Spruce caused by the honey fungus in the Rzyki forest administration zone of the domain of Saybusch, Upper Silesia, according to its status in the spring of 1942.]—*Tharandt. forstl. Jb.*, xciii, 11–12, pp. 659–676, 4 figs., 1 graph, 1 map, 1942. [Received December, 1944.]

This is a detailed account, with special reference to the prevailing meteorological, geological, and ecological conditions in the Saybusch district of Upper Silesia, of a dying-off of spruces in that locality caused by the honey fungus (*Agaricus melleus*) [*Armillaria mellea*]. The disease is almost exclusively confined to pure stands, where its symptoms first become noticeable on trees of an average age of 40 years and reach a climax at 50 to 70. According to information elicited from foresters long resident in the affected zone, shrivelled trees in the final stages of the malady were little in evidence before 1930, but from 1935–6 onwards their numbers increased progressively until in 1942 they represented 65 per cent. of the assessment.

The foci of infection originate in groups, which in the course of the next three to five years spread over scattered areas of 1 to 2 ha., recognizable by the presence of the clustered elder [*Sambucus racemosa*]. Within these well-defined zones, the writer examined 127 trees, the otherwise undamaged root systems of which showed incipient symptoms of attack by *A. mellea*, and observed that in 94 per cent. the mycelium developed on the roots extending in an easterly direction. In most cases the mycelium radiated from two or three brownish centres, 2 to 4 sq. mm., situated near the root-collar on the surface in contact with the soil. Running in the direction of the junction between root and trunk, the mycelium partially encircles the collar and induces a necrosis of the conducting vessels, which appears as a brownish streak 5 to 10 cm. wide at the base of the tree and narrowing towards the crown. A layer of resin, 0·5 to 2 cm. in width, is formed between the necrotic and the living cells, or the substance may be deposited in the shape of inclusions of up to 0·25 l. Already at this stage the fresh, dark colour of the needles is overlaid with a grey-green tint. The duration of the disease, from the first visible signs to the drying-up of the trunk, accompanied by a sudden shower of needles, ranges from one or two

years in the case of 10-year-old stands to between seven and ten for those of 50 to 60 or upwards. The wood of trees attacked by *A. mellea*, if felled in good time, i.e., when the shower of needles is observed, may safely be classed as grade B, but any timber left standing until a later stage will be of inferior quality and should not be utilized in any damp or airless parts of buildings, though it is quite suitable for the roof.

The paper concludes with recommendations for silvicultural practices based on the renewal of the old, diseased, pure spruce stands by means of an admixture of fir [*Abies*], larch, and beech.

Gosselin (R.). **Studies on Polystictus circinatus and its relation to butt-rot of Spruce.**—*Farlowia*, i, 4, pp. 525–568, 3 pl., 6 graphs, 1944.

From a critical study of the taxonomy of the spruce butt-rotting fungus originally described by Fries as *Polyporus circinatus*, which is of local importance in Quebec as an agent of excessive windfall [*R.A.M.*, xxi, p. 57], the writer concludes that the organism should be referred to *Polystictus circinatus* (Fr.) Cooke [ibid., xxi, p. 174]. Associated with this species and hitherto identified with it is *Polyporus tomentosus* Fr., which may be distinguished from the foregoing by its brighter-coloured sporophores and its predominant occurrence on the ground, and is likewise regarded as belonging to *Polystictus*, the combination *P. tomentosus* (Fr.) Fr. being accepted. The whole confusion between the two species is attributed by the author to Fries's description of the context of *Polyporus tomentosus* as homogeneous, whereas in both the fungi under discussion it is duplex. In *Polystictus circinatus*, however, the setae are preponderately curved, while those of *P. tomentosus* are straight. A list is given of the herbarium specimens of the fungus available for study and their correct systematic position.

An intensive survey was made to determine the prevalence of *P. circinatus* in Quebec. Near Mt. Albert, on the northern side of the Gaspé Peninsula, the incidence of infection amounted to 100 per cent., while it ranged from 20 per cent. in the valley near Lake Walker (north bank of the St. Lawrence) to 90 per cent. on the mountain slope in the same area and 95 per cent. along the York River. On the other hand, no sign of the butt rot could be observed in the Laurentide National Park.

Crowding did not appear to be a decisive factor in the development of *P. circinatus*, which also occurred both in pure spruce stands and in those with an admixture of firs below 60 per cent. Unlike *P. tomentosus*, however, it was not observed in mixed stands of hard- and softwoods.

Temperature and humidity are the most important factors in sporophore development, which is promoted by the cool and moist conditions prevailing after 15th August and during September. The southern limit of *P. circinatus* appears to be reached at the 36th parallel of longitude.

No external signs of disease accompany the early stages of infection, which takes place through the lateral roots, but in the later ones the foliage turns yellowish-green and resin may be exuded from the stem bases.

Lumsden (G. Q.). **New woods for cross arms and their preservation.**—*Bell Lab. Rec.*, xxii, 14, pp. 573–576, 4 figs., 1944.

War-emergency demands for coastal Douglas fir [*Pseudotsuga taxifolia*] and southern pine [*Pinus* spp.] timbers, normally used by the Bell System for the support of their open-wire lines, have necessitated recourse to the most readily available substitutes, red and jack pines [*P. resinosa* and *P. banksii*] and inland [? Douglas] fir for the same purpose. Cross-arms of these species were treated, 1,100 at a time, by an improved hot- and cold-bath non-pressure process, involving two to four hours' immersion in a tank containing creosote heated to above 220° F.,

followed by a similar period in 5 per cent. pentachlorphenol in an aromatic petroleum at 90° to 125°. The retention of preservative solution averaged about 8·5, 6·4, and 0·6 lb. per cu. ft. for *P. resinosa*, *P. banksii*, and inland fir (heartwood). After curing about 8,000 of the treated arms were installed by the Associated Telephone Companies for periodic observation in line. Breaking tests on samples at Chester, New Jersey [*R.A.M.*, xxiii, p. 246] indicated that inland fir is practically as strong as coastal Douglas fir and southern pine, and red and jack pines 80 per cent. as durable, the latter degree of strength being considered sufficient, except in extra long spans under heavy loading conditions. Equally promising results were obtained in Canada by the similar treatment of red and jack pine cross-arms.

Weiss (F.). **Viruses described primarily on leguminous vegetable and forage crops.**—*Plant Dis. Reptr, Suppl.* 154, pp. 32–80, 1945. [Mimeographed.]

This is the second in a series of descriptive lists of plant viruses in course of preparation by the Committee on Virus Classification and Nomenclature, American Phytopathological Society [cf. *R.A.M.*, xxiii, p. 438]. The aim of this compilation is merely to present an organized summary of the available literature on the subject, no attempt having been made to resolve problems on which further research is required. As far as possible, the common names for the viruses are in conformity with those used in the *Review of Applied Mycology*, a list of which was issued by the Imperial Mycological Institute on 1st January, 1944 [ibid., xxiii, p. 79].

Foster (H. H.) & Pinckard (J. A.). **Control of Cabbage mildew by means of benzene vapour.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1000, 1944.

Benzene vapour, applied nightly from 24th November (36 hours after inoculation with *Peronospora parasitica*) to 28th December to experimental seed-beds of early cabbage in Mississippi, resulted in an average of 256 seedlings per sq. ft. compared with 158 for the untreated controls, the average lengths of the two lots being 4·9 and 2·8 in., respectively. The most effective practice consisted in the use of 50 c.c. benzene per 15-gm. cotton ball suspended in the seed-bed at 2-yd. intervals, evaporation being prevented by the use of wet covers with a thread count of 48 by 44. Very satisfactory control was also secured after the development of mildew in farm beds by the use of 50 c.c. benzene per sq. yd. on three nights of each week until the formation of the first true leaf. After the conclusion of the treatments cold, wet weather intervened, and was followed by an outbreak of the disease, indicating the necessity for continued applications until the seedlings are transplanted to the field.

Millard (W. A.). **Canker and mosaic of Broccoli.**—*J. Minist. Agric.*, lii, 1, pp. 39–42, 1945.

During the last eight years the broccoli crop throughout England has been on the decline as a result of canker (*Phoma lingam*), always troublesome in the north, and mosaic cauliflower mosaic virus [*R.A.M.*, xxii, p. 122], which appears to have spread from south-western areas northwards. In some instances, these diseases have been so severe that the entire crop has been destroyed. Canker develops in the autumn after planting and becomes increasingly conspicuous in the spring and summer on plants left for seeding. It appears as a dark brown wound or lesion on the stalk, generally on one side only, though sometimes girdling the stem. The lesion varies in length from ½ to 2 in. The outer tissues become badly cracked lengthwise. The inner flesh is dry, brown, and dead sometimes as far as the centre of the stalk. The flower head is small and unmarketable, or the stalk may break. Good control has been obtained by seed treatment in hot water (122° F. for 25 minutes), but the best method is to raise disease-free seed, by growing the treated seed as far away

as possible from all cruciferous crops and carefully removing all suspicious plants during the season.

Mosaic has recently been far more serious and widespread than canker. Old *Brassica* crops should be ploughed in or burnt, while plants kept for seed should be sprayed against the aphid carrier [*Brevicoryne brassicae*] during the second or third week of May with a wash consisting of 3 oz. nicotine (96 to 98 per cent.), 4 lb. soft soap, and 40 gals. water, or dusted on a warm day with a 4 per cent. nicotine dust. The main crops should be treated in the same way in early and late July. Any plants that become infected should be removed and burnt.

Hooker (W. J.), Walker (J. C.), & Link (K. P.). **Effects of two Mustard oils on Plasmodiophora brassicae and their relation to resistance to clubroot.**—*J. agric. Res.*, lxx, 3, pp. 63–78, 3 figs., 2 graphs, 1945.

Allyl isothiocyanate occurs in the roots of horse-radish and beta-phenethyl isothiocyanate in those of cabbage, the former, and probably the latter, as its glucoside. Either of these two mustard oils above a certain concentration inhibits spore germination in *Plasmodiophora brassicae* [*R.A.M.*, xxii, p. 507]. By weight they are nearly equally toxic so that the molecular toxicity of the phenethyl oil is nearly twice as great as that of the allyl oil. The toxicity was tested by inoculating young cabbage plants with spore suspensions treated with each of the oils. In this case the molecular toxicity appeared to be nearly equal. At concentrations below the toxic level the oils stimulated germination, but the results were less consistent in the case of the beta-phenyl oil. To produce the same effect a greater concentration of spores required a greater concentration of the mustard oil. The concentration of potentially available beta-phenethyl isothiocyanate in the roots is roughly comparable with the concentration required to prevent disease development, but this is true of both resistant and susceptible crucifers. The liberation of this oil in appreciable quantities has not been demonstrated and it seems unlikely that the concentration could be maintained as high outside the plant as inside. If oil concentrations in the soil solution were below the toxic level a stimulatory effect on *P. brassicae* spores may conceivably be induced. In fact, it is possible that the mustard oils, if present in the soil solution in the proper concentration, may actually predispose cruciferous plants to infection rather than control it. Allyl mustard oil does not stimulate all spore development, for it fails in the case of *Colletotrichum circinans*.

Leach (L. D.). **Sugar-beet diseases.**—*Sug. Beet Bull.*, ix, 1, pp. 1–8, 12 col. figs., 1945.

Popular, descriptive notes are given on some well-known sugar-beet diseases in the United States, accompanied by excellent coloured reproductions of photographs to assist in the identification of the symptoms.

Hull (R.) & Watson (M[arion] A.). **Virus yellows in Sugar-beet root and seed crops.**—*Kirton agric. J.*, 10, pp. 45–48, 1945.

This brief, semi-popular paper contains suggestions for the control of sugar-beet yellows [*R.A.M.*, xxii, p. 123] in eastern England.

Harter (L. L.) & Zaumeyer (W. J.). **A monographic study of Bean diseases and methods for their control.**—*Tech. Bull. U.S. Dep. Agric.* 868, 160 pp., 30 figs., 3 maps, 1944.

The available information concerning the etiology, geographical distribution, economic importance, symptomatology, morphology and physiology of the causal organisms, modes of dissemination and transmission, and other points of interest, is summarized and critically discussed in this valuable compilation on field and

garden (*Phaseolus vulgaris*) and Lima (*P. lunatus* var. *macrocarpus*) bean diseases in the United States. In addition to fungal and bacterial pathogens, the bulletin deals with virus and parasitic disorders of the crops, and is supplemented by a bibliography of 571 titles.

PERSON (L. H.). **Parasitism of Rhizoctonia solani on Beans.**—*Phytopathology*, xxxiv, 12, pp. 1056–1068, 4 figs., 1944.

Rhizoctonia [*Corticium*] *solani* is the agent of damping-off and a reddish-brown stem rot of beans in Louisiana, and investigations were carried out at the State Agricultural Experiment Station to determine whether 27 isolates of the fungus from some of its many other hosts were pathogenic to *Phaseolus vulgaris*.

Twelve isolates from eight hosts varied considerably in growth in Petri dish cultures at seven temperatures between 6° and 38° C. [*R.A.M.*, iii, p. 361; viii, p. 138; xx, p. 618; xxii, p. 86, *et passim*], only a trace being made at the minimum by strains from tomato, eggplant, and bean, compared with 6 to 9 mm. for the other nine. The optimum and maximum temperatures also varied for the several isolates, the former ranging from 20° to 25° for the potato strain and from 25° to 30° for the others, while the sugar-cane, bean, and one of the two sugar beet isolates grew slowly at 38°, which was lethal to the remainder.

Four fairly clear-cut groups were differentiated on the basis of their pathogenicity to beans in greenhouse and field soil-infection tests, namely, (1) comprising isolates from sugar-cane and from sclerotia on potato tubers, which did not noticeably affect beans; (2) those from peas, causing a very slight degree of damping-off and moderate stem infection; (3) the rice strain, which almost entirely prevented emergence but produced less severe stem lesions than the pea isolates; and (4) isolates from bean, tomato, eggplant, and sugar beet, responsible for some reductions in the stands and heavy damage to the stems. As already observed by Fulton (*Bull. La agric. Exp. Sta.* 101, 1908), uninjured plants wilted as frequently but less rapidly than slightly wounded ones following inoculation with *C. solani*.

In further greenhouse experiments on soy-beans, peas, cowpeas, and broad beans, in comparison with beans, the sugar-cane and potato strains were as harmless to the supplementary legumes as they were to beans, while the destructive rice strain was equally pathogenic to peas, cowpeas, and broad beans, but less so to soy-beans. The two pea strains, which caused little damage to beans, varied in their effects on three of the other hosts, one being fairly pathogenic to soy-beans (stands reduced from 49 to 24 per cent.) and almost entirely preventing the emergence of peas and broad beans, while the other did not injure soy-beans to any extent and was only moderately virulent on peas and broad beans: both isolates were of medium pathogenicity to cowpeas. The three strains from bean, one each from eggplant and tomato, and two from sugar beet, all of which caused comparable reductions in bean stands, differed on soy-beans, peas, and cowpeas, the sugar-beet strains being less virulent than the others on the first two and non-pathogenic to the last-named. All these strains prevented the emergence of broad beans.

The non-pathogenicity of the sugar-cane and potato isolates is of interest and may assume practical importance in connexion with the rotation system in the alluvial sections of Louisiana, where these hosts of *C. solani* are economically valuable.

HOLDSWORTH (M.) & HEATH (O. V. S.). **Ripening of the Onion bulb and infection by Botrytis species.**—*Nature, Lond.*, clv, 3933, p. 334, 1945.

The writers have observed a number of cases of infection, apparently by *Botrytis* spp., of the swollen bulb scales of onions [*R.A.M.*, xxiii, p. 161], another probable

path of invasion being provided by the pores of the older leaves, which sag open as they wither and form humid pockets for the lodgment and germination of air-borne spores. This mode of infection leads to the development of neck rot, in which the leaf base tissues are killed high up on the neck near the pores, where the whole neck may, in fact, be rotted through before the bulb shows any external symptom of the disease. In this connexion the common horticultural practice of bending the plants over at the neck to hasten maturity is considered likely to promote the entry of the pathogens by breaking or bruising the next emerging leaf blade.

Wilson (J. D.). **The control of Celery blights with Bordeaux, the fixed coppers with and without sulphur, and fermate.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 227, pp. 95–109, 1944.

Since the author and Newhall submitted their programme for spraying and dusting against celery early and late blights (*Cercospora apii* and *Septoria apii*) in 1930 [*R.A.M.*, x, p. 220], the fixed-copper compounds have been introduced and developed for fungicidal purposes. Their performance in relation to the control of the celery pathogens has been investigated in numerous experiments during the last ten years, and still more recently various 'organic' materials have been tested for the same object. Bordeaux mixture was included as a standard treatment in nearly all the tests on muck-grown crops herein described, mostly at a strength of 8–8–100 (8–12 and 8–4 in a few instances), and consistently ranked at or near the top of the list in blight control and yield increases. In 38 individual comparisons with copper compounds, it ranked first 32 times and was significantly superior in 11 of those trials. In 12 comparative experiments with six fixed coppers covering a seven-year period, copper A excelled in four out of every five yield assessments, followed in decreasing order of effectiveness by copper oxychloride sulphur (COC-S), cuprocide, copper hydro 40, tribasic, and cupro-K, comparable ratings being assigned in respect of blight control.

Spraying with various fixed coppers and Bordeaux caused some reduction in yield in the absence of the blights, the nature of the injury being apparently partly mechanical and partly physiological. Dusting and spraying were of approximately equal value in the control of celery pathogens, but the former method, as with other foliar diseases of vegetables, required greater skill and care than the latter. When the fixed coppers were subjected to temperatures of about 335° F. before application under a steam pressure of 100 lb. with a vapour sprayer, the degree of disease control approximated to that obtained with the usual hydraulic pressure apparatus. The same treatment reacted unfavourably on Bordeaux, the fungicidal action of which was improved, however, at 300° and 75 lb.

In general, the benefit derived from the addition of spreaders and adhesives to the fixed coppers was insufficient, both in respect of enhanced blight control and heavier yields, to justify the continuance of this practice, nor was the admixture of lime of any value for the ends in view. A six-day interval between treatments, which should start about a fortnight after transplanting and continue until just before blanching, was found to give better results than one of four or eight days, the former tending to damage the plants while the latter failed to confer adequate control. The rate of application should be about 150 gals. spray or 40 lb. dust per acre.

Sulphur proved ineffectual alone in combating the blights or significantly augmenting production, but it did give satisfactory results as an adjunct to the fixed coppers, especially tribasic. The average increase in yield from 4–8–100 sprays or 14–20–66 (talc) dusts was 0·8 ton trimmed celery per acre, and the improvement in the foliage rating amounted to 9·5 per cent.

COC-S dust mixtures prepared with various diluents did not differ to any extent in their toxicity to the blights, and there was little to choose between an acid clay

(Cherokee) and an alkaline talc (EM23) as spreaders for COC-S, cuprocide, and tribasic.

In three experiments fermate approached the best copper treatments in disease control and gave substantial yield increases. It should be used at a dosage of 3–100 as a spray or 10–90 with talc as a dust.

Wilson (J. D.) & Wilson (J. J.). **A mosaic-tolerant, pickling-type Cucumber.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 227, pp. 110–113, 3 figs., 1944.

It appears from the results of preliminary tests that the Ohio 31 cucumber, a homozygous segregate of the hybrid Tokio Long Green × National Pickle, offers definite promise as a substitute for the latter in areas where mosaic is a limiting factor. In comparative tests in 1943, over 50 per cent. of the National fruits harvested on 23rd August showed symptoms of the disease, as against only 1·7 per cent. in Ohio 31, the maximum degree of infection manifested by which did not exceed 3 per cent. throughout the trials. Mosaic reached a climax in National during the fortnight following the 23rd August picking, and many of the plants died, but Ohio 31 continued to produce a large proportion of healthy fruits until the final gathering on 18th September.

Reichert (I.), Palti (J.), & Minz (G.). **Field trials for control of downy and powdery mildew of cucumbers. I. On the efficacy of copper compounds.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 96–116, 1 fig., 1944.

Eleven spraying and dusting experiments for the control of cucumber downy and powdery mildews (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [*R.A.M.*, xxiii, p. 253] and *Erysiphe cichoracearum*) were carried out, with the assistance of B. Kapuler, in different parts of the Palestine coastal plain over the six-year period from 1935 to 1941. The success or failure of the treatments was shown to be determined largely by the number given, several materials effectively combating downy mildew when the interval between the applications did not exceed four days, while one of ten days was too long. The best results in the downy mildew trials were given by perenox (cuprous oxide) at a concentration of ⅓ per cent., the action of 1 per cent. Bordeaux mixture, ⅓ to ½ per cent. cuprogreen concentrated (⅓ to ½ per cent.), and three copper dusts, cupryl, cuprogreen dust, and Bordeaux dust Cooper, being somewhat weaker; powdery mildew yielded only to perenox. Bordeaux mixture not only failed to increase the yield but tended to reduce it, presumably through foliar injury. Yellowing of the leaf margins was caused by perenox, whereas cuprogreen concentrated was innocuous in this respect; the two preparations were comparable in their effects on yield, which they increased by 30 to 70 per cent. The action of the copper dusts was inconsistent in this respect. In one trial during a drought, the addition of 1 per cent. medium white oil to the perenox spray reduced the yield by 35 per cent. The copper treatments, notably perenox, markedly increased the percentage of cucumbers picked during the last part of the fruiting period, an important economic factor in the case of late summer crops. Spraying is cheaper than dusting where labour is obtainable at low cost, but in young fields, requiring only small quantities of material, dusting may be preferable, in spite of the higher initial outlay, especially where foliar damage from spraying is to be anticipated.

Reichert (I.). **Studies on Mushrooms and other fungi of the forests of Palestine. III. An edible forest truffle, its taxonomy and geography.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 193–204, 1 pl., 2 figs., 1 map, 1944.

A full description is given of a truffle, *Delastriopsis oligosperma*, discovered two years ago in a pine (*Pinus halepensis*) forest near Tel Aviv, the first record of a truffle in Palestine. Another truffle, *Terfezia gennadii*, found in Greece, is re-named *D. gennadii* (Tul.) Reichert comb. nov.

Allington (W. B.). **Soybean disease investigations.**—*Soybean Dig.*, iv, 11, pp. 60, 65, 1944.

Much of the work hitherto performed by the United States Regional Soybean Laboratory in connexion with its recently inaugurated campaign for the control of diseases through the use of resistant varieties has consisted of phytopathological surveys and inspections of variety nurseries in 24 States. As a result of the 1943 and 1944 investigations, the following diseases (in the order given) are considered to be of actual or potential economic importance: bud blight [*R.A.M.*, xxiv, p. 133], bacterial pustule and bacterial blight [*Xanthomonas phaseoli* var. *sojense* and *Pseudomonas glycinea*], sclerotial blight [*Sclerotium rolfsii*] (confined to the Southern States), pod and stem blight [*Diaporthe phaseolorum* var. *sojae*], downy mildew [*Peronospora manshurica*: ibid., xxii, p. 463], and wildfire. The last-named, a new and alarming development, is caused by a bacterium similar to, or identical with, the agent of tobacco wildfire [*Pseudomonas tabacum*], and was responsible for severe local damage, though the total losses to date from this source are insignificant. The disease was observed in the corn [maize] belt, Louisiana, and Oklahoma.

The present almost exclusive cultivation of the Lincoln soy-bean is deprecated as tending to provide a focus for the particular fungi or their physiologic races to which this variety may in future prove to be susceptible, though so far its performance has been eminently satisfactory.

Colwell (W. E.). **Fertilizing Soys in North Carolina.**—*Soybean Dig.*, v, 3, pp. 11–12, 2 figs., 1945.

Soy-beans on the dark, highly organic, poorly drained soils of the North Carolina Lower Coastal Plain suffer from potash deficiency [*R.A.M.*, xxii, p. 463], which results in low yields and constitutes a major problem in production in the area under observation. Experiments showed the beneficial effects of top dressings of 50 to 100 lb. muriate of potash per acre prior to the first cultivation. Depending on previous soil amendments, the application of 200 to 300 lb. 0–10–10 or 0–12–12 (or 3–9–9 if following small grain) is recommended. The calcium and magnesium requirements of the soils can be met by the broadcasting of 1,000 lb. dolomitic limestone per acre.

Tervet (I. W.). **The influence of fungi on storage, on seed viability and seedling vigor of Soybeans.**—*Phytopathology*, xxxv, 1, pp. 3–15, 3 figs., 1945.

Species of *Alternaria* were the most frequent occupants of soy-bean seed samples from 19 counties of Minnesota examined in 1942, causing an average of 28·9, 33·2, and 56·3 per cent. infection in the south-east, south-west, and central sections of the State, respectively, followed by *Fusarium* spp. (19, 12·1, and 10), and bacteria (16, 14·3, and 15·2). The incidence of damage by micro-organisms increased in proportion to the extent of frost injury. A comparative investigation of two lots of seed, one from Minnesota (seven samples) and the other from Illinois (six) revealed 18 to 40 per cent. *Alternaria* infection in the former and 0 to 12 per cent. in the latter, the corresponding figures for *Fusarium* being 1 to 11 and 0 to 25 per cent., respectively. The Minnesota lot, with 55 per cent. frost damage, had a moisture content of 6·6 per cent. after two months' storage at 2° C. After a further month in a humidifier at room temperature, which raised the moisture content to 17·6 per cent., the seeds of a sample of the damaged lot were very mouldy, and when 200 were planted on potato dextrose agar, 66 per cent. gave rise to *Aspergillus* spp., as opposed to only 1 per cent. in the low-moisture batch. The high-moisture seeds were exposed to 21 days' adiabatic heating in an apparatus similar to that described by Ramsted and Geddes (*Tech. Bull. Minn. agric. Exp. Sta.* 156, 1942), whereby the temperature was raised from 22° to 46·9°; at the end of this period 98 per cent. were free from internal microflora. Ten lots of beans with a moisture

content of 21·2 per cent. were stored under adiabatic conditions for 19 days, during which period the temperature rose from 29·4° to 77°; samples were analysed for microflora and tested for viability at intervals, 200 seeds being plated and duplicate rows of 100 untreated and 100 arasan-treated seeds planted in a greenhouse at 70°. During the first week of storage, the percentage of sterile seeds decreased from 89 at 22° to 36 at 44·4°, and at the same time the incidence of *Aspergillus* (chiefly *A. glaucus*, *A. flavus*, and *A. ochraceus* [*R.A.M.*, xiv, p. 671]) infection rose from 5 to 53 per cent.; a decline followed, and by the 15th day at 59·7° the fungi had disappeared. Besides the foregoing, *A. niger*, *A. fumigatus*, *Chaetomium* sp., *Cephalothecium* [*Trichothecium*] *roseum*, *Cunninghamella echinulata*, *Rhizopus nigricans* [*R. stolonifer*], and *Penicillium* sp. were occasionally present in the seeds. The arasan treatment (maximum adhesion dosage) improved the vigour and increased the stand of the plants. *A. flavus* was apparently the species predominantly concerned in the retardation of seedling growth.

Wyckoff (R. W. G.). **Some biophysical problems of viruses.**—*Science*, N.S., ci, 2615, pp. 129–136, 1945.

This is a discussion of some of the problems confronting workers engaged on studies connected with (*a*) the concentration, purification, and physico-chemical properties of viruses, (*b*) the specific antigens produced by the animal or plant host in response to infection, and (*c*) the deeper investigation of virus-antibody interaction made possible by purification.

Richards (B. L.) & Munger (H. M.). **A rapid method for mechanically transmitting plant viruses.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1010, 1944.

A high-velocity spray stream has given promising results [at the Utah Agricultural Experiment Station] in the transmission of bean virus 4 [southern bean mosaic] and two strains of bean virus 1 [mosaic] to beans, and several strains of cucumber virus 1 [cucumber mosaic] to cucumbers. Diluted viruliferous juice, containing 300-to-400-mesh carborundum, was sprayed on the plants from a distance of 5 to 7 cm. through a suction-feed atomizer made of 5-mm. glass tubing, drawn to 0·5 to 1 mm. orifices, using an air pressure preferably exceeding 30 lb. or a cylinder of liquefied carbon dioxide. The operations were greatly facilitated by the connexion of the atomizer with the source of pressure by means of a cut-off assembly (De Vilbiss No. 633). In large-scale greenhouse and field tests in 1944, the spray-stream technique proved fully equal, if not superior, to the carborundum-rubbing method and enabled the work to be carried out in about a quarter of the time.

Sixty-third Annual Report of the New York State Agricultural Experiment Station.—62 pp., 1945.

In the report from the Division of Plant Pathology (pp. 30–38) J. M. Hamilton and D. H. Palmiter state that fermate (½–100) is much more effective than sulphur against the cedar-apple [*Gymnosporangium juniperi-virginianae*] and quince [*G. claviceps*] rusts on the Rome Beauty apple and that fermate in combination with wettable sulphur 3–100 (for scab [*Venturia inaequalis*] control) affords good protection. The spray should be applied at the pink, bloom, and petal-fall stages and again ten days later. Sulphur dust containing 4 per cent. fermate was used successfully.

In respect of correctives for soluble phytotoxic materials released from fungicides, it is suggested that air drainage is a factor in russet injury, which is less prevalent at a moderate elevation. During wet weather a mixture of fermate and lead arsenate is a safer spray than a wettable sulphur and lead arsenate for the Delicious and Golden Delicious varieties. For the control of leaf spot [*Coccomyces hiemalis*]

on Montmorency cherries, spray mixtures containing copper were found by J. M. Hamilton and D. H. Palmiter to be effective, Bordeaux 4–4–100 giving the best protection. Sulphur materials were inadequate. Cupro-K gave a good balance between injury and disease control if used with a sticker. A mixture of micronized sulphur 3–100, cupro-K 1½–100, and lime 1½–100 gave promising results.

The results of field experiments by D. H. Palmiter indicate that a green-tip application of 1 per cent. elgetol to Kieffer pear trees will sufficiently reduce the sooty-blotch fungus, *Gloeodes pomigena*, to permit a commercially clean crop without summer applications of fungicides.

In studies by R. F. Suit on the stunt disease of blueberries in 1941 about 100 plants of each of the following varieties were planted in muck soil: Pioneer, Concord, Rubel, Jersey, and Rancoras. The results of these and previous plantings indicate that the two first-mentioned varieties are more susceptible than the rest and that the disease increases more rapidly in muck soil.

Under New York conditions Indian Summer, Marcy, and Milton red raspberries may be considered resistant to mosaic. The Morrison black readily becomes diseased, while Evans is less readily attacked than the other black varieties. The Marion purple is not as susceptible as the Sodus or the black raspberries. An effect of the mosaic was that only about half as many tips were put down from infected plants and these produced poor and diseased canes.

In experiments during the past five years on the control of spur blight, *Didymella applanata*, 1 per cent. elgetol gave satisfactory results on the resistant varieties Latham and Chief, and usually on Newburgh. A weaker strength was ineffective and applications were most successful when the buds showed about ½ in. green tissue. The disease was not satisfactorily controlled by this method on the susceptible variety Indian Summer, but an application of fermate, 2 lb. to 100 gals., made when the new shoots were 12 to 15 in. high, gave 70 per cent. control.

G. L. McNew reports that in wet, cold soils all varieties of pears are susceptible to seed decay and it is incorrect to suppose that late varieties are immune. Field and greenhouse tests with some 65 varieties and strains show that seeds differ in response to seed decay as much within a variety as within a species. Under not unduly severe conditions Alaska varieties are fairly resistant and those of Thomas Laxton moderately so. Copper compounds tend to be slightly toxic to all varieties under certain soil conditions, but materials such as spergon, arasan, fermate, 2 per cent. ceresan and semesan appear to be safe on all varieties.

In a pea rotation test by the same author, O. A. Reinking, and W. T. Schroeder it was found that *F. solani* var. *martii* f. 2 and *Aphanomyces euteiches* were not eliminated by a three-year fallow, though the infestation was reduced. A field plot continuously in peas for four years had about 100 per cent. disease in the early stages of pea development, mainly due to *A. euteiches*.

Good disease control of canning tomatoes was obtained by G. L. McNew against early blight [*Alternaria solani*] and *Phytophthora* blight and fruit rot [*P. infestans*] with the insoluble coppers, COCS, microgel, compound A, and yellow cuprocide, as well as with Bordeaux. Two newer materials, 2, 3-dichloronapthoquinone 1, 4 and zinc dimethyl dithiocarbamate offered considerable promise as controls for early blight. In the 1943 tests it was found possible to halve the concentration of either the copper compound or the fermate and yet secure effective control. Fermate alone did not satisfactorily control early blight, *Phytophthora* fruit rot, or *Cladosporium* [*fulvum*] fruit mould, but the copper compounds controlled the first two and also appear to offer some promise with the latter.

Of 30 introduced hop varieties only one, Brewer's Gold, is at present recommended by R. O. Magie for commercial production. This is highly resistant both to downy and powdery mildews [*Pseudoperonospora humuli* and *Sphaerotheca humuli*]. Other seedlings developed in the experimental yard may be found equally

satisfactory. The differences in yields between plots of the varieties Late Cluster, Millstate, and Brewer's Gold, in which each plot was restricted over a three-year period to a particular spray mixture, were not significant, so that there was no apparent difference in the deleterious effects of each spray. The mixtures used were Bordeaux 6–4–100 with and without ½ per cent. cottonseed oil, yellow cuprocide 1½–100, and zinc sulphate-lime 6–4–100. Wettable sulphur dust 5–100 was added to each spray mixture. Low-lime Bordeaux appeared equally safe.

The treatment of hop poles and twine with fungicides is practical and effective in reducing downy mildew infection. Stacked poles were sprayed in April with Bordeaux 20–10–100, yellow cuprocide 5–100, tribasic copper sulphate 10–100 or fermate 10–100 at about 35 gals. per acre. The copper materials were better than fermate, reducing the shoot infection by as much as 85 per cent. A similarly good effect was produced on twine. The hop twine was cut to length and soaked in one of the following and dried before use: Bordeaux 7½ per cent. and 2½ per cent. lime, tribasic copper sulphate 6 per cent., and yellow cuprocide 4½ per cent. Organic materials gave less protection.

Seed treatment of Fordhook Lima beans [*Phaseolus lunatus*] is not recommended by H. S. Cunningham to Long Island growers as a profitable practice. Under conditions of low soil moisture and low rainfall there was some protection but not otherwise. Copper materials hardened the seed coat and stunted the seedling.

In recent years, Long Island potato-growers have suffered considerable loss from seed-piece decay caused by a species of *Fusarium*. Most of the trouble occurs where the grower has cut the seed three or four weeks before planting. It may be spread to healthy pieces by the planter itself. The decay can be largely prevented by treating the whole tubers with yellow oxide of mercury at the rate of 1 lb. to 30 gals. water.

Fifty-fourth Annual Report for the fiscal year ended 30th June, 1944.—*Bull. Wash. St. agric. Exp. Sta.* 455, 168 pp., 1 map, 1944.

In the section of this report [cf. *R.A.M.*, xxii, p. 239] dealing with plant pathology (pp. 64–71), the following items are of special interest. Work by L. K. Jones showed that losses from potato leaf roll could be virtually eliminated in the Ellensburg and Moses Lake areas of Washington State if growers always planted certified seed and practised rotation. M. L. Schuster found that a species of *Fusarium* appeared to be the principal cause of seedling blight of peas. L. K. Jones and E. J. Anderson demonstrated that the stem and root rot of peas prevalent in the Palouse is due to *F. solani* f. *pisi*.

C. S. Holton states that no new races were identified among the collections of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*] tested [ibid., xxii, p. 239], though the tests included two collections which appeared to represent new races in 1943. Pathogenicity in several artificially produced hybrids was ascertained to be highly stable, and the selective influence of the host was of importance in establishing races produced by hybridization. Two hybrid races were identical in pathogenicity with two recently identified races of *T. caries*. Two hybrid wheat selections from a Rex×Rio cross were highly resistant to all races of bunt, while another, Washington Selection 6, was resistant to all except T–16 and L–8. Other new varieties were resistant to some races. Satisfactory control of bunt was obtained in winter and spring wheats with several compounds; spergon, arasan, Du Bay 1452 C, and No. 53–501–62 were approximately as effective as new improved ceresan.

A number of hybrid selections of wheat proved strongly resistant to two races of flag smut [*Urocystis tritici*] in greenhouse tests, indicating that resistant parent varieties are available for breeding purposes.

Two new races of *Ustilago avenae* and one of *U. levis* [*U. kolleri*] were identified

from seven collections of each species. These are particularly important because they are virulent on the Victoria type of resistance, which has been used in much of the oat breeding programme. The Ventura variety was highly resistant to all except three of the 26 races of *U. avenae* and *U. kolleri* used in the tests. Several selections from the Victoria × Richland cross were highly resistant to collections of the race that attacks Victoria.

G. W. Fischer found four new races of *U. bullata* [ibid., xxi, p. 294] in collections of head smut of forage grasses. Two were virulent on *Bromus marginatus*. This brings the total number of races to 12, of which four attack mountain brome. A broad range of susceptibility to these 12 races was discovered among 14 selections of mountain brome and Canada wild rye (*Elymus canadensis*). One strain of mountain brome was almost immune, while Canada wild rye was generally more susceptible than mountain brome.

Post-treatment storage of seed for periods ranging up to eight weeks did not influence the effectiveness of five fungicides against *U. bullata* and stripe smut [*U. striiformis*: ibid., xix, p. 351] of Canada wild rye. New improved ceresan gave the best control, while arasan (4 oz. per bush.) was almost equally effective. Copper carbonate was moderately effective against stripe smut, but ineffective against head smut. Overdoses of new improved ceresan were lethal to seeds and seedlings. Thiosan gave excellent smut control, increased stands, and remained uninjurious when used in quantities as large as would adhere to the seed.

J. D. Menzies obtained good evidence that the leaf-hopper *Platymoideus acutus* is a vector of witches' broom disease of lucerne [ibid., xxiii, p. 3]. Selection No. A–6 continued to show much less infection than any other variety or selection of lucerne under test.

M. L. Schuster found that attack by soil-borne fungi and seed coat injury due to threshing were responsible for poor stands of flax. In seed samples, the amounts of seed with broken coats varied from 10 to 15 per cent. for Zenith and Redwing to 65 to 75 per cent. for Viking and Bison. In isolations from flax seedlings, the fungus most frequently obtained was *Fusarium oxysporum*. Pathogenicity tests showed it to be a virulent parasite. Species of *Penicillium* and *Alternaria* reduced stands through infection of seeds with broken testas. In field and greenhouse tests improved stands resulted from the use of spergon, new improved ceresan, and Du Bay 1205–FF (50 per cent. tetramethyl thiuramdisulphide). Chemical seed treatment gave much greater increases in stands with machine- than hand-threshed seed.

J. D. Menzies and L. K. Jones state that as most of the virus diseases of stone fruits now present in the Yakima Valley spread slowly in the orchards, a programme providing disease-free propagating material should do much to secure their control. In the case of western X-disease of peach [ibid., xxiii, p. 391], which is capable of rapid spread, eradication of affected trees appears to be a feasible way of restricting infection.

Forty-eighth and forty-ninth Annual Reports of the Montana Agricultural Experiment Station July 1, 1940 to June 30, 1942.—63 pp., 1 map, [? 1942]. [Received March, 1945.]

In the section of these reports dealing with botany and bacteriology (pp. 19–24), H. E. Morris states that if elite wheat seed, free or almost free from bunt [*Tilletia caries* and *T. foetida*] is planted, much less bunt will occur in the resulting crop than would otherwise be the case. A soil temperature of about 50° F. and a moisture content of about the optimum for plant growth favour bunt. The best time to plant wheat in Montana in order to avoid infection appears to be from 10th to 20th September, the soil temperature then being favourable for growth and unfavourable for bunt.

For many years past, the annual loss from oat smuts [*Ustilago levis* and *U. kolleri*] in Montana has been approximately 10 per cent., largely, if not entirely, due to lack of seed treatment. Oat seed should be treated with new improved ceresan (½ oz. per bush.) or formaldehyde solution or dust.

When Great Northern beans were first grown locally mosaic caused an estimated loss every year of from 6 to 8 per cent. of the crop. Yields were improved when the practice of sowing certified seed was adopted. Later, some Idaho selections of Great Northern beans which were immune from mosaic were planted, and these have now virtually replaced the former 'field-run' stock of seed. Much progress has been made in the selection of individual plants for freedom from disease and desirable commercial qualities. Several selections have remained free from mosaic for several years, and an intensive test regarding their productiveness is to be made.

During 1941, some 67,000 acres of fertile, irrigated land in Montana were planted to sugar beet. An investigation into seedling diseases of this crop [*Phoma betae*, *Pythium* spp., and *Rhizoctonia* spp.: *R.A.M.*, xxi, p. 510; xxiv, p. 86] showed that seed treatments were only of slight benefit. Beets grown in plots well fertilized with manure in autumn and given a supplementary dressing in spring with nitrogen and phosphate in the form of artificial fertilizers invariably developed only insignificant infection. The lowest amount of seedling disease and the heaviest and largest seedlings resulted in plots given a dressing of 1 part treble superphosphate and 6 parts calcium nitrate or 4 parts ammonium sulphate. It was also found that when calcium nitrate and treble superphosphate were applied, the amount of seedling disease was less than when ammonium sulphate and treble superphosphate were used. Other experiments showed that the lowest amount of seedling diseases occurred when the beets were planted after maize, these diseases developing in increasing amounts after potatoes, oats, lucerne, beans, beet, and continuous fallow. Low soil temperatures (about 50°) and a minimum of moisture (50 per cent. saturation) also favoured freedom from seedling diseases. Even with maximum and optimum soil moistures (85 and 75 per cent. saturation, respectively) seedling diseases were relatively low at low temperatures, and increased considerably with high temperatures. These results stress the importance of planting sugar beets early, while temperatures are still low.

Botany.—*Rep. Ga Exp. Sta., 1943–44*, pp. 53–60, [1944].

This report [cf. *R.A.M.*, xxiii, p. 6] contains, *inter alia*, the following items of phytopathological interest. Germination of Spanish groundnut seed was consistently improved by treatment with 2 per cent. ceresan, arasan, and spergon in that [descending] order. Seed treatment gave no significant increase or decrease in yield per plant, but did increase yields through improved stand. In further trials for the control of groundnut leaf spot [*Cercospora arachidicola* and *C. personata*: loc. cit.], Spanish groundnuts received three applications of sulphur dust or copper-sulphur dust (10–90) or eight of Bordeaux mixture (6–2–100) at intervals of 10 to 15 days, while the later-maturing North Carolina Runner variety received four applications of sulphur or copper-sulphur dust. The average increases in yield of nuts for the Spanish variety were 262, 249, and 177 lb. for sulphur, copper-sulphur, and Bordeaux mixture, respectively. These increases were the lowest obtained in seven years. Over most of the area concerned rainfall was extremely light, and infection was less severe than usual. On North Carolina Runner, sulphur dust and copper-sulphur dust gave increases of 808 and 308 lb., respectively. Other work again indicated that the harvesting of dusted groundnuts may be spread over a longer period than that of undusted nuts.

On p. 17 of this report it is stated that in the course of a fertilizer test *Sclerotium rolfsii* was found attacking Spanish groundnuts due for digging in two weeks' time. The plants were still green, but the roots and nuts were almost destroyed.

A week later, the infected plants died. The North Carolina Runner variety appeared to be unaffected. In the case of the Spanish groundnuts, nitrogen applications reduced the amount of disease in every instance, while nitrogen and potash in combination gave plants that were almost unaffected. By far the heaviest infection occurred in the plots given phosphorus and potash in combination, while the plots without fertilizer came next. Yield of nuts closely followed disease incidence.

A comparative study is being made to determine whether the species of *Guignardia* causing black rot of muscadine [*Vitis rotundifolia*] grape vines is identical with *Guignardia bidwellii*, which causes the disease on bunch grapes [*V. vinifera*: loc. cit.]. Successful greenhouse inoculations demonstrated the pathogenicity of *G. bidwellii* on bunch grapes and of the *G.* species on muscadines, and the genetic connexion of the imperfect states of the fungi associated with leaf-spotting and stem and fruit cankers with the perfect stages on overwintered leaves and berries. Attempts to obtain infection of muscadines with spores of *G. bidwellii* from bunch grapes did not succeed. This, with the fact that cultures from bunch grapes and those from muscadines differ, indicates that the two organisms differ, at least varietally.

While the muscadine fungus causes a considerable amount of leaf-spotting, cankers on the petioles and stems, and some stem-tip and blossom blight, it attacks only a small percentage of the fruit, and infected berries are not often completely destroyed. On vigorous, well-kept muscadine vines the disease does not appear to be of sufficient importance to justify the expense of controlling it. The only means of eradicating the disease would seem to lie in thorough pruning, burning all refuse, and destroying any wild muscadine vines in the vicinity.

Macrophomina phaseoli and *S. rolfsii* [loc. cit.] were again the chief fungi associated with root rot of snap beans [*Phaseolus vulgaris*]. *M. phaseoli* produces a charcoal rot of seedling beans and root rot and stem lesions of older plants. Very young seedlings affected by charcoal rot are entirely blackened and collapsed; only the *S. bataticola* stage is found on such seedlings. If, however, enough woody tissue has developed to hold the plant erect after its death, pycnidia form on the above-ground parts of the lesions. After the death of older plants killed by root infection, the fungus spreads over the whole plant, producing the ashy stem-blight phase of the disease. Numerous pycnidia over the whole surface of the plant raise the cuticle, causing the stems to appear pale grey. Ashy stem blight may appear independently of root rot on plants from blossoming until maturity. Reddish-brown discolorations appear on the stems. Parts of the stem above the point of infection die and are covered by pycnidia. Leaves are similarly infected, and the fungus often enters the stem from diseased leaves. Pycnidia are produced on the leaves also. All isolates from snap bean, whether pycnidia were present or not, and isolates from the two common bean-field weeds, coffee weed [*Cassia* sp.] and *Lactuca scariola*, produced pycnidia in culture on sterile bean stems.

Diaporthe sojae [ibid., xix, p. 256] was found in one locality on snap bean and in another on cowpea, soybean, and Lima bean [*P. lunatus*]. Perithecia developed on overwintered stems of all four hosts.

Some hybrid peas gave earlier and better growth and considerably more seed than the Austrian Winter variety, which was used as a control. This variety became severely affected by root rot [largely *Aphanomyces euteiches*: ibid., xx, p. 211], but some of the hybrids showed considerable tolerance towards the disease.

The vetch leaf spot disease previously reported as due to a *Botrytis* [of the *B. cinerea* group: ibid., xxiii, p. 347] was more prevalent and severe in one locality than in the past, particularly on *Vicia grandiflora*, though all the varieties grown were more or less affected. The Smooth and Purple varieties appeared to be most resistant. Rotation should keep the disease down, but the fungus is widespread

and attacks many other plants, including lupins. Lupin diseases studied include anthracnose (*Glomerella cingulata*), stem rot (*B. cinerea*), root rots (*Rhizoctonia* [*Corticium*] *solani*, *Pythium* sp., *Fusarium oxysporum* f. *radicis-lupini*, *F. solani* f. *lupini*, and *F. moniliforme* [*Gibberella fujikuroi*], and foot rot (*S. rolfsii*).

Bacterial wilt of *Lespedeza* [ibid., xix, p. 543] is now known to occur in Georgia.

C[ardenas] (M.). **Algunas enfermedades criptogámicas y entomológicas constatadas en Bolivia de 1942–1944.** [Some cryptogamic and entomological diseases observed in Bolivia from 1942 to 1944.]—*Rev. Agric., Cochabamba*, ii, 2, pp. 39–40, 1944.

During the two-year period under review, the following diseases, among others, were observed on economic or ornamental crops in Bolivia: *Taphrina deformans* on peach, *Venturia inequalis* on apple, *Erysiphe cichoracearum* on chicory, *E. polygoni* on American tomatoes and *Dahlia*, *Puccinia glumarum* on wheat, and *Uromyces caryophyllinus* on carnation.

Hoerner (G. R.). **Crown gall of Hops.**—*Plant Dis. Reptr*, xxix, 4, pp. 98–110, 1945. [Mimeographed.]

Since the author's account of the economic importance of *Agrobacterium* [*Bacterium*] *tumefaciens* on hops [*R.A.M.*, xiii, p. 727] much work has been done respecting the host range of the pathogen. Inoculation by means of a hypodermic syringe, using a suspension of the organism in water, was found to be a satisfactory method of testing. The results are tabulated. Of 2,958 inoculations made on 210 species, those of 157, representing 71 genera and 37 families, were successful. These included commercially important crops, such as cauliflower, turnip, radish, melon, peas, hemp, tomato, tobacco, carrot, and potato. It is noteworthy that in the Cactaceae the tissue adjacent to the punctures was usually killed and the process of infection checked.

Hodgson (R.), Riker (A. J.), & Peterson (W. H.). **Polysaccharide production by virulent and attenuated crown-gall bacteria.**—*J. biol. Chem.*, clviii, 1, pp. 89–100, 1945.

The isolation, purification, and properties of several polysaccharide preparations from cultures of virulent and attenuated strains of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xxi, p. 409] are described. More polysaccharide was obtained from virulent than from attenuated cultures. The polysaccharide from the latter appears to be identical with the low molecular-weight glucosan produced by the former. Glucosan evolved by the virulent strain from sucrose, glucose, and fructose varied in yield but possessed the same properties. Under the experimental conditions employed the glucosan was not readily utilized by the organism as a source of carbohydrate.

Coleman (Madeline F.) & Reid (J. J.). **A serological study of Alcaligenes radiobacter and Phytomonas tumefaciens in the 'M' and 'S' phases.**—*J. Bact.*, xlix, 2, pp. 187–192, 1945.

A study was made of the serological relationship between *Alcaligenes* [*Bacterium*] *radiobacter* and *Phytomonas* [*Bact.*] *tumefaciens* [*R.A.M.*, xix, p. 461; xxiii, p. 378] with the aid of the agglutination and agglutinin absorption techniques described by Dawson and Sia (*J. exp. Med.*, liv, pp. 681–700, 1931) and Krumwiede *et al.* (*J. Immunol.*, x, pp. 55–239, 1925), respectively. Seven strains of the former organism (non-pathogenic to tomato) were used and two of the latter, which caused virulent infection on the same host. The bacteria were found to differ serologically in the 'M' phase, but were antigenically identical in the 'S', as indicated by complete reciprocal agglutinin absorption. The data are interpreted

as an indication that *Bact. radiobacter* and *Bact. tumefaciens* are alternative aspects of a single species, which in their normal 'M' phase bear the same mutual relation as do the various types of *Pneumococcus*.

Garcés (C.). **Informe sobre Cacao.** [Report on Cacao.]—*Rev. Fac. Agron., Medellín*, v, 21, pp. 249–262, 1944.

This report (dated 15th December, 1939) on cacao in the Garzón district, Department of Huila, Colombia, contains the following information on diseases [cf. *R.A.M.*, xxi, p. 7]. *Phytophthora faberi* [*P. palmivora*] is widespread and responsible for heavy losses, and a further complication lies in its frequent occurrence on the trunk and branches in a masked form, precluding its recognition until an advanced stage is reached. The only effective means of control is the excision of the infected tissue and the application to the wound of Bordeaux paste or arbosan. It is absolutely necessary that the cuts should extend to a depth of at least 2 cm. beyond the visible zone of infection in order to prevent the further penetration of the fungus into the underlying tissues.

A species of *Sphaeronema* is associated, invariably in the company of Scolytid beetles, with a yellow rot, the same fungus having been reported as the agent of a similar disease in Ecuador. The dark-coloured lesions on the trunk, resembling those produced by *P. palmivora*, exude throughout the winter an abundance of watery, yellow-reddish, malodorous liquid. On the removal of the cortex, the woody tissues are found to be largely involved in a yellow discoloration interspersed with black and yellow patches.

A progressive decline of the aerial parts of the tree and a black discoloration of the roots are tentatively attributed to a species of *Rosellinia* [ibid., xvi, p. 202]. The best method of control is the isolation of the diseased and immediately adjacent healthy trees by means of trenches 40 cm. in width by 60 cm. in depth prior to their eradication and burning *in situ*. The cavities left by the uprooting of the trees should be liberally sprinkled with lime and the ground allowed to rest for at least a year before replanting.

Monilia [*roreri*: ibid., xxi, p. 8] presents a problem of extreme gravity, being responsible for immense losses (up to 100 and averaging 30 per cent. of the pods). The fungus has probably been introduced into Colombia from the contiguous areas of the Republic of Ecuador, where it is indigenous [ibid., xvii, p. 801]. Infected pods are utterly destroyed, and such is the reproductive activity of the pathogen that it constitutes a perpetual source of inoculum in a plantation. Besides the common form of the 'watery rot' there is an insidious type of the disease causing abortion of the pods and total failure of the crop. Control measures should include environmental modifications, such as pruning of the cacao and shade trees to regulate humidity and admit sufficient light; eradication of old, diseased trees to provide space and facilitate ventilation; and the installation of drains to carry off excess water. Bordeaux mixture 4–4–50 should be applied to the young pods, the number of treatments being dictated by local conditions. Infected pods should be collected and buried *in situ*, with an admixture of lime, to prevent the propagation of the fungus by means of its spores.

Of minor importance are black pod rot [? *Colletotrichum* sp.], brown rot [*Botryodiplodia theobromae*], and die-back, reference to which was made in the author's previous report [ibid., xxi, p. 7].

Stakman (E. C.), Levine (M. N.), & Loegering (W. Q.). **Identification of physiologic races of Puccinia graminis tritici.**—Issued by U.S. Dep. Agric., B.E.P.Q., 27 pp., 1 fig., 1944. [Mimeographed.]

The greater part of this useful publication is devoted to a tabulated summary of the reactions of 12 varieties of wheat to 189 races of *Puccinia graminis tritici*

and a key for identifying these races based on whether the reactions on the differential hosts are classed as 'resistant' (no uredia or uredia minute to small), 'susceptible' (uredia medium to large), or 'mesothetic' (uredia variable). In addition there are notes on the differential varieties, the techniques for the collection and preservation of the rust samples, the inoculation and management of the test plants, and the use of the key and tables. The identification of mixtures of races in one collection is also touched on.

Baker (G. A.) & Briggs (F. N.). **Wheat bunt field trials.**—*J. Amer. Soc. Agron.*, xxxvii, 2, pp. 127–133, 1 graph, 1945.

In studying the inheritance of resistance of wheat to bunt (*Tilletia tritici*) [*T. caries*; *R.A.M.*, xiii, p. 20; xx, p. 457] it is necessary to grow F_3 progenies from F_2 plants in order to determine the genotype of the latter, since all susceptible plants do not usually show the disease under conditions generally prevailing. Furthermore, some heterozygous resistant and occasionally some homozygous resistant plants become diseased. When two or more factors are involved in resistance it may be difficult to recognize these genotypes and genetical analysis may be unsatisfactory.

At the California Agricultural Experiment Station a mathematical model of wheat bunt field trials has been constructed which should be of aid in interpreting complex hybrids in that the nature of variances will be better understood. The mean and spread of the heterozygous plants cannot be observed, but may be calculated because the means and variances of the percentages for the homozygous and segregating rows can be observed, and it can be assumed that the probabilities of infection for different types of plants are perfectly correlated as between rows.

Rosen (H. R.). **Breeding Oats to combine resistance to race 45 and other races of crown rust common in Arkansas.**—*Phytopathology*, xxxv, 2, pp. 143–144, 1945.

In 1944, for the first time, race 45 of crown rust (*Puccinia coronata*) [*R.A.M.*, xviii, p. 242] attacked spring-planted Bond oats with such severity as to constitute a distinct hazard to future crops, besides reducing yields considerably in the current season. Infection appeared shortly after the booting, and by the time of the early milk stage had covered at least 30 per cent. of the leaf area. The Mutica Ukraina variety, previously reported to be highly resistant to races 33 and 34, was found to be virtually immune from race 45, and one of the hybrids (674 (2)–39 f), arising from crosses between it and R3–II showed a marked capacity to withstand not only 45 but also 1, 7, and several others of less frequent occurrence in the State. R3–II in its turn was derived from a cross between Coker 32–I and (Victoria × Richland C. I. 3313), so that the hybrid possesses two different sources of crown rust resistance, Victoria and Mutica Ukraina, and two of resistance to smut [*Ustilago avenae* and *U. kolleri*], Coker 32–I and Victoria.

Patel (N. M.). **Inheritance of loose smut reaction in crosses with Victoria and smut resistant (Cornell) 6 under field conditions of growth and infection.**—*Abstr. Thes. Cornell Univ.*, 1942, pp. 378–379, 1943.

In investigations into loose smut (*Ustilago avenae*) inheritance in oats, it was found that Victoria and Rust Resistant (Cornell)–6 were highly resistant, Upright moderately susceptible, and Canadian, Ithacan, Victor, Lenroc, Series 1060 Lot -44, and Strain No. 428a 3–49 very susceptible. The inoculum used was a mixture of the two physiologic races of the fungus prevalent in New York, Reed's 21, which is the Ithaca race, and Reed's 1 (Missouri).

In all crosses resistance was dominant over susceptibility. A mono-Mendelian ratio of 3 resistant : 1 susceptible was observed in the F_2 of ten crosses. A duplicate

factor ratio of 15 resistant : 1 susceptible was observed in the cross Series 1060 Lot–44 × Smut Resistant (Cornell)–6 in the F_2. In the F_3, some families bred true for smut resistance, some segregated into 3 resistant : 1 susceptible, and some into 15 resistant : 1 susceptible or smutted. These F_3 families gave a distribution of 7 : 4 : 4, respectively. In the cross between the black-glumed Victor and the reddish-glumed Victoria the loose smut reaction segregated independently of the lemma coloration.

Canadian, Victor, Lenroc, Upright, and Ithacan each differed from Victoria in one gene for smut reaction and carried the recessive allele for smut reaction in its genotype, predisposing it to develop smut upon infection. Victoria carried the dominant homologous gene, enabling it to resist invasion by the smut. Lenroc, Strain No. 428a 3–49, and Upright each differed from Smut Resistant (Cornell)–6 in one gene and carried the dominant gene for smut reaction, enabling it to resist invasion by the mycelium of *U. avenae*, which usually takes place in the early seedling stage. Series 1060 Lot–44 carried two pairs of independently segregating genes in a recessive condition as compared with Smut Resistant (Cornell)–6, which bore in its genotype two dominant genes allelic to the two carried by Series 1060 Lot–44. All these genes were equally effective in producing the smut reaction.

Atkinson (R. E.). **A new mosaic chlorosis of Oats in the Carolinas.**—*Plant Dis. Reptr*, xxix, 3, pp. 86–89, 1945. [Mimeographed.]

First noticed in 1944, a mosaic of oats similar in pattern to those induced by virus in wheat and sugar-cane has appeared in North and South Carolina. The mottling appears conspicuously in spring as cream-coloured streaks, usually ten or more times as long as wide, chiefly on the basal part of the leaf but extending over the whole lamina and sheath. Dwarfing is not so extreme as to produce a 'rosette' appearance, but in some species rolling imparts a resemblance to wild garlic leaves, as in wheat mosaic. Sometimes only the lower leaves are affected and there are indications of recovery or 'growing-out'. The severity of the disease is particularly marked in genetically pure selections, in which it may cause a 50 per cent. or more reduction of yield. The following varieties have been found resistant: Coker's Victorgrain 43–1, 4, 43–5, 43–11, and 43–12, Coker's Fulgrain 6, Fulwin, Wood's Victorgrain 182, and Fulgrain 304, while of other species of *Avena*, *A. fatua*, *A. brevis*, *A. wiestii*, and particularly *A. barbata* are resistant. The varieties Selina, Letoria, and Stanton recommended for the Carolinas are all attacked. An even more important source of loss than the mosaic disease itself is that it undoubtedly predisposes oats to winter-killing and *Helminthosporium* foot rot.

Deva Rajan (M. R.) & Aiyappa (K. M.). **Leaf-fall and fruit-rot disease of Oranges.**—*Indian Fmg*, v, 11, pp. 512–513, 1945.

Heavy losses are caused over half the area under oranges, conservatively estimated at 10,000 acres, in the Coorg district of Madras, by *Phytophthora palmivora* [*R.A.M.*, xx, p. 401], which attacks trees of all ages up to 100 years, occurs in every type of soil and at altitudes of up to 4,000 ft. above sea-level, and is unaffected by atmospheric humidity within the limits of a rainfall ranging from 40 to 200 in. per annum. The first symptom, excessive defoliation spreading from the lower branches upwards, appears suddenly and develops with extreme rapidity with the onset of the monsoon at the end of May or early in June. The diseased leaves bear dark brownish, watery-looking patches, and similar lesions are later found on the fruits, which decay and drop. An objectionable odour is emitted by both foliage and fruits and is diffused from two or three diseased trees over an entire orchard. The malady, though not immediately fatal, is liable to recur in the next rainy season and probably leads to the premature death of the trees

through weakness. A single application of 1 per cent. Bordeaux mixture will prevent the onset of the disease, but it may have to be repeated if the symptoms are observed in August or September. This method of control originally applied by the Department of Agriculture, Madras Province, to infected orchards in the Malabar district, was found to be equally effective, as well as economically profitable, in the region served by the Orange Research Scheme, Coorg.

Miller (E. V.), Winston (J. R.), & Meckstroth (G. A.). **The use of HCHO and Na *o*-phenylphenoxide in the control of decay in Citrus fruits.**—*Citrus Ind.*, xxv, 10, pp. 3, 15, 18, 1944. [Abs. in *Chem. Abstr*, xxxix, 5, p. 996, 1945.]

Sodium ortho-phenylphenoxide (dowicide A) effectively controlled citrus fruit decay but injured the rinds, a drawback which was overcome by the addition of one part by weight of commercial formaldehyde (37 per cent.) to 4·5 parts of the fungicide. The mixture can be used both in aqueous solution and wax emulsions, but in the latter case it should be added to the water diluent, not to the wax itself. The treatment was successful only when the mixture was applied as a warm flood spray at concentrations of 1¼ to 2 per cent.

Harvey (J. V.). **Fungi associated with decline of Avocado and Citrus in California (III).**—*Plant Dis. Reptr*, xxix, 4, pp. 110–113, 1945. [Mimeographed.]

Records are given of the incidence of fungi from the roots of declining avocado and citrus trees in California in 1944 [*R.A.M.*, xxiii, p. 454]. *Phytophthora cinnamomi* [ibid., xxi, p. 149] was found in 55 per cent. of the declining avocado trees examined, whereas only 20 per cent. of non-declining trees yielded this fungus; these were almost all from decline areas, and in some cases developed the disease later. The fungus, which is prevalent in moist, badly drained soil, may be considered as of primary importance in the decline of avocado. *Pythium vexans* is also frequent in declining avocado groves (on 203 out of 436 declining trees compared with 143 out of 442 healthy) and, though probably of less importance, is worthy of further investigation. In citrus, especially lemon and Valencia orange, *P. ultimum* occurs frequently enough to deserve investigation also, namely, on 45 out of 83 declining trees of the former and 63 out of 121 of the latter, compared with 14 out of 42 and 34 out of 107 healthy, respectively. *Phytophthora citrophthora* seems to be unrelated to decline in citrus, but is a good 'index fungus' in foot rot.

Ezekiel (W. N.). **Synthetic culture media for the root-rot fungus Phymatotrichum omnivorum.**—*Phytopathology*, xxxv, 3, pp. 159–161, 1945.

For convenient reference, and to avoid the necessity for continuous re-description of the synthetic media in common use for the culture of the cotton root-rot fungus, *Phymatotrichum omnivorum*, five important formulae (three liquid and two solid) are presented.

Brumpt (E.). **Les Entomophthorées parasites des Moustiques. Étude critique. Recherches personelles.** [The Entomophthoreae parasitic on Mosquitoes. Critical study. Personal investigations.]—*Ann. Parasit. hum. comp.*, xviii, pp. 112–144, 15 figs., 1941. [Received April, 1945.]

From vats filled with macerated leaves and other organic products and water, with or without an admixture of sodium arsenite, at the Richelieu Experiment Station, Indre-et-Loire, 105 specimens of *Culex pipiens* (of which 101 were females) and one female of *Theobaldia annulata* destroyed by a species of *Empusa* were collected between 29th August and 30th September, 1940, this number representing some 5 per cent. of the total mosquito population visiting the artificial laying-grounds. Six members of the Entomophthoreae have been recorded in the relevant literature on mosquitoes, namely *Empusa culicis* Braun, 1855,

Entomophthora sphaerosperma Fres., 1856, *Empusa conglomerata* Sorokin, 1876 (non Thaxter, 1888), *E. rhizospora* Thaxter, 1888, *E. henria* Molliard, 1918, and *E. schroeteri* Brumpt, 1940 (*E. rimosa* Schroeter non Sorokin, 1876), renamed in *C. R. Acad. Sci., Paris*, ccxi, p. 483, 1940.

The species isolated from the Richelieu insects is in almost complete agreement with *E. conglomerata*. Only one (0·28 per cent.) of the numerous oral and cutaneous inoculation experiments on 355 larvae and adults was successful (in the former stage), and projects for the large-scale dissemination of entomophytic fungi are considered to be futile, having regard to the dependence of epizootics on climatic factors outside human control.

Drobotko (V. G.). **Stachybotryotoxicosis, a new disease of Horses and Humans.**—*Amer. Rev. Soviet Med.*, ii, 3, pp. 238–242, 1945.

The author summarizes the available information on the etiology, symptomatology, and modes of infection of stachybotryotoxicosis (*Stachybotrys alternans*), a disease of horses in the Ukraine [*R.A.M.*, xxii, p. 138], which occasionally affects humans coming into contact with infected hay, the original habitat of the pathogen.

Conant (N. F.), Martin (D. S.), Smith (D. T.), Baker (R. D.), & Callaway (J. L.). **Manual of clinical mycology.**—xiii+348 pp., 137 figs., 11 maps, Philadelphia & London, W. B. Saunders Company, 1945. 17*s.* 6*d.*

This volume is one of a series produced under the auspices of the Division of Medical Sciences of the National Research Council to supply the medical departments of the United States Army and Navy with succinct presentations of essential information in the field of military medicine. Knowledge of fungous infections is of paramount importance to medical officers at the present juncture, when thousands of men in the Forces are engaged in the field in tropical regions where mycoses abound, and the same applies to the doctors at home under whose care returning soldiers will be placed. With these objects in view, the manual comprises clear-cut clinical descriptions of the systemic and superficial mycoses, elucidations of problems of nomenclature and differential diagnosis, and simplified and practicable classifications and methods. The maps showing the geographical distribution of a number of the diseases are a very useful feature of the treatise.

Brierley (P.) & Smith (F. F.). **Additional specimens of Lilium susceptible to Lily-rosette virus.**—*Phytopathology*, xxxv, 2, pp. 129–131, 1 fig., 1945.

As a result of inoculation experiments with the rosette virus isolated from Florida-grown Easter lilies (*Lilium longiflorum*) [*R.A.M.*, xxiii, p. 439], using *Aphis gossypii* as the vector [ibid., xix, p. 517], the following species were found to develop some or all of the characteristic symptoms of the disease, namely, plant dwarfing and curling, foliar yellowing and reddening, and dwarfing or absence of flowers: *L. elegans*, *L. formosanum*, *L. henryi*, *L. leucanthum*, *L. longiflorum*, *L. myriophyllum* var. *superbum*, *L. regale*, *L. sargentiae*, *L. speciosum*, and *L. umbellatum*. In *L. formosanum*, *L. sargentiae*, and *L. umbellatum* the pathological changes became evident about three weeks after infection and the disease could be diagnosed with a fair degree of accuracy, but in none of the other species tested were the symptoms as clear-cut as in *L. longiflorum* and confusion with the effects of root injury or poor cultural conditions might well be expected to occur in the field. In such cases, moreover, the virus may be harboured and disseminated by plants of superficially normal aspect serving as unsuspected reservoirs of inoculum.

Imle (E. P.). **The basal rot disease of Lilies.**—*Abstr. Thes. Cornell Univ.*, 1942, pp. 370–372, 1943.

Basal rot of lilies, shown by the writer to be present in Japan, Holland, France,

the Pacific Northwest area of the United States, the Midwest, and the Atlantic seaboard States, is stated to have caused a loss of 70,000 bulbs in a single planting of *Lilium testaceum*. Up to 61 per cent. reduction of yield resulted in susceptible species, while losses of 31 per cent. occurred in storage.

The disease was shown to be due to a fungus referred to *Fusarium oxysporum* f. *lilii* [*R.A.M.*, xxiv, p. 149]. The morphological characters of culture No. 176 (*L. candidum*, Michigan), with which those of the other pathogenic isolates closely agreed, are as follows: average of 315 normal macroconidia, 37·9 by 4·4μ, mostly 3-septate; 1 to 16 per cent. 4-septate, measuring 43·6 by 4·5μ. They are pointed towards the apex, smaller in diameter above than below the middle, and pedicellate. The microconidia are rare to 5 per cent. of the total number of spores, the non-septate measuring 8 by 2·7μ, and the 1-septate 16 by 3·8μ. The aerial mycelium is moderately abundant. The macroconidial masses are light salmon-orange and are produced beneath the aerial mycelium in pionnotes. Bluish sclerotia are present. The chlamydospores are terminal and intercalary in hyphae and conidia and measure 8 to 11μ in length. Mature cultures are white to vinaceous on barley heads, white to La France-pink, geranium-pink or scarlet-red on rice, and white to capucine-buff or pale vinaceous-pink on sweet clover stems and potato dextrose agar.

The following species and hybrids were found to be highly resistant: *L. hansonii*, *L. sargentiae*, and *L. maximowiczii*. The fungus does not attack common bulbous plants other than lily, except crocus.

Distribution of the pathogen takes place chiefly by means of diseased bulbs. The pathogen is disseminated by spores, infected plant parts, and infected tools, soil, and equipment. Spores are abundantly present in packing houses and crates, and the fungus was also found repeatedly in the dry, brown tissue at the edge of scales fallen from diseased bulbs. Such scales are commonly used for propagation.

Baines (R. C.). **Verticillium wilt and die-back of Viburnum.**—*Phytopathology*, xxxv, 2, pp. 145–147, 1945.

Verticillium albo-atrum was isolated from *Viburnum lantana* and *V. tomentosum* suffering from an unthrifty condition and die-back, frequently culminating in death, which was first observed at Lafayette, Indiana, in 1940. In addition to the characteristic external symptoms produced by the fungus, brown sectors or continuous bands of discoloured wood were observed, frequently extending from the base to the tip of infected canes. Inoculation experiments on 2-ft. high *V. lantana* shrubs with maize meal-sand cultures of the pathogen from *Viburnum*, *Chrysanthemum*, and peppermint introduced into the soil gave positive results and the results of additional inoculations on other hosts are tentatively interpreted as indicative of variation in the pathogenicity of the cultures under investigation comparable to that reported by Tilford and Runnels in connexion with *Chrysanthemum* wilt (*Bull. Ohio agric. Exp. Sta.* 630, 1942) [cf. *R.A.M.*, xxi, p. 203].

Kreitlow (K. W.). **Ustilago striaeformis. III. A further study of factors that influence after-ripening of chlamydospores from Poa pratensis.** –*Phytopathology*, xxxv, 3, pp. 152–158, 1945.

Chlamydospores of stripe smut (*Ustilago striiformis*) from *Poa pratensis* [*R.A.M.*, xxiii, p. 110] were after-ripened in host tissue free from contaminants, becoming germinable in 10 to 25 days, occasionally longer. After washing free of host tissue, other samples were after-ripened on bits of filter paper incubated at 35° C. in a moist chamber. Treatment of the chlamydospores in a Waring blender [as used by Andrus: ibid., xx, p. 546] for various periods from 15 seconds to five minutes expedited after-ripening and increased germinability from 75 to 90 per

cent. Fresh chlamydospores stored at 5° for 60 days and then transferred to 35° took longer (10 to 20 days) to after-ripen than a comparable batch maintained at 25° (three to five days). The spores should be in actual contact with water for successful after-ripening, those incubated in a saturated atmosphere requiring longer to germinate, while dry storage altogether inhibited the process of maturation.

Cooley (J. S.). **Susceptibility to black root rot of Apple trees having various root and top combinations.**—*Phytopathology*, xxxv, 2, pp. 142–143, 1945.

Continuing his studies in Maryland on the susceptibility of apple to *Xylaria mali* [*R.A.M.*, xxii, p. 69], the writer determined the reactions of trees two years from the graft, either own-rooted or worked on an own-rooted tree of known variety, inoculation being carried out annually for four years from 1937. Since the degree of susceptibility was not appreciably influenced by the top, the several root and top combinations were grouped according to the 21 root varieties. The tabulated results show that while there were some differences in susceptibility, none of the tested experimental varieties is outstandingly resistant to *X. mali*.

Cooley (J. S.). **The effect of manure and of commercial fertilizer on susceptibility of young Apple trees to black root rot.**—*Phytopathology*, xxxv, 3, pp. 207–209, 1945.

At the Plant Industry Station, Beltsville, Maryland, no consistent or outstanding differences were observed in the reaction to black root rot (*Xylaria mali*) of nursery Wealthy and Early Ripe apple trees [see preceding abstract] supplied with (*a*) manure (14 tons per acre) or (*b*) commercial fertilizer in seven combinations of 107 lb. each of muriate of potash and acid phosphate and 324 lb. sodium nitrate per acre over a period of seven years for the former and four for the latter treatment.

Hildebrand (E. M.). **Pithy cherry disease of Sour Cherry in New York.**—*Plant Dis. Reptr*, xxix, 4, pp. 116–117, 1945. [Mimeographed.]

'Pithy cherry', a name given by growers to a new disease of Montmorency cherry fruit in New York, is characterized by the appearance on the ripe fruit of several depressed, dark, corky lesions beneath the skin and sometimes reaching to the pith. At maturity the spots are nearly black, the appearance of the fruit rendering it unmarketable. Up to 12 per cent. of the trees may be involved in different rows in affected orchards and the percentage of diseased fruit on individual trees ranged up to 50 per cent. No micro-organisms have been found associated with the disorder. A virus was suspected to be the agent, but it was found that grafts from cherry trees infected with the 'pithy' disease recovered when grown on healthy trees, though they carried the ring-spot virus. In an experiment in 1943–4 it was further shown that the symptoms of 'pithy cherry' disappeared after the application of 5 oz. borax per tree, whereas the untreated trees showed slight symptoms, so it is thought that the disease may be of physiogenic origin and due to boron deficiency, though proof of this is not yet established.

Mrak (E. M.). **Microbiological deterioration in dried and dehydrated fruits.**—*Canner*, c, 17, p. 22, 1945.

Spoilage of unsulphured dried fruits is mostly due to yeasts belonging to the genera *Zygosaccharomyces*, *Hanseniaspora*, *Kloeckera*, and *Saccharomyces* [cf. *R.A.M.*, xxii, p. 143]. In prunes, contamination begins in the orchard, but moulds and yeasts are killed during dehydration, recontamination occurring in subsequent handling. As they pass over the grader, prunes pick up micro-organisms from the water used to swab down grader screens. Considerable losses occur, and

undesirable changes take place within the fruit. This might be remedied by sanitary handling immediately the fruit leaves the dehydrator. Contamination of sun-dried fruit is even worse, the organisms not being killed during drying.

With figs, most of the deterioration results from contamination in the orchard. Mites which enter the young fig carry the spores of the *Aspergillus* that causes smut [*A. niger*: ibid., xiii, p. 42]. Spores of *Fusarium* and other fungi and yeast are carried to some figs by insects in the caprification process. Yeast souring results to some extent from high humidity during the ripening season. External yeast growth may occur in the dry yards or with other handling.

With dates, mould or, more commonly, yeast growth occurs when humidity is high in the ripening season. Dehydration and heat treatment are inadvisable as they invert the sucrose and cause darkening.

The first step in control must take place in the orchard. Within the packing plant, pasteurization is not applicable to bulk packages. Packing at low moisture content does not permit packaging the best possible product. Fumigation with ethylene oxide or mixtures of this and other chemicals gives completely satisfactory results; it permits packaging at suitable moisture levels and eliminates the necessity for heat treatment.

Lewcock (H. K.). **Soft rot (winter blister) disease of Pineapples.**—*Qd agric. J.*, lx, 1, pp. 42–45, 2 figs., 1945.

An account is given in semi-popular terms of the symptoms, causal organism, mode and development of infection, and control of soft rot or water blister disease of pineapple caused by *Ceratostomella paradoxa* [*R.A.M.*, xi, p. 193; xx, p. 374].

Thomas (C. A.). **The effect of some commercial fungicide dust fillers on plant growth.**—*Proc. La Acad. Sci.*, vii, pp. 16–17, 1942. [Received April, 1945.]

Investigations were carried out at Baton Rouge, Louisiana, to determine the effects on plant growth of the fungicide dust fillers, bentonite clay, eastern magnesia talc, and pyrax (Tennessee Copper Company). Peas and beans germinated in a filtrate containing one part bentonite to 50 of water developed a brown discoloration of the roots, while the former, grown directly in the filler, were stunted and the plants wilted within ten days. In comparable tests with the other two diluents no toxic effects were observed, and none of the substances proved injurious when dusted on clover and lucerne plants in the greenhouse.

Notes contributed by the Biological Branch.—Sterilization of seed bed soil.—*Agric. Gaz. N.S.W.*, lvi, 2, pp. 71–73, 2 figs., 1945.

Brief, popular notes are given on the sterilization of seed-bed soil by heat (baking, steaming, hot water, and surface burning) and by chemical treatment (formalin, carbon bisulphide, and chloropicrin).

Answers to growers. *John Innes Bull.* 1, 60 pp., 15 figs., [1945].

On pp. 7–8 of this bulletin, W. J. C. L[awrence], dealing with the question whether composting will destroy a virus, states that in 1943 a compost was made from out-of-door tomato plants severely affected by tobacco mosaic, cucumber mosaic, and possibly other viruses. Ten Harbinger tomato plants raised in J.I. [John Innes] seed compost were potted on 11th May, 1944, into (*a*) the pure tomato compost, and (*b*) J.I.P. [John Innes potting compost] for comparison. Growth in the pure compost was unexpectedly good, though, naturally, less satisfactory than in J.I.P. No sign of virus disease was seen at any time on the leaves of either the clean or the virus-composted plants. Subsequent examination showed that five plants carried the tobacco mosaic virus, the roots, though not the tops,

evidently having become infected from the compost. When, in a further experiment, tomato plants were grown in the open in ground treated with (*a*) virus-infected tomato compost and (*b*) horse manure, both at 20 tons per acre, the health and yield of the plants were equally good in both plots.

M. B. C[RANE] (pp. 51–53) deals with two abnormalities of Lord Lambourne apples, (1) 'rubbery wood', in which the branches are soft and lack rigidity, and (2) 'chat fruit', in which the fruits are very small. These defects generally occur independently, but may be present on the same tree. On one estate in Hampshire the author saw established Excelsior trees top-grafted with Lambourne. They were a mass of rubbery growth. The grafts had been taken from healthy Lambourne trees grown on the estate. Thus, the rubbery abnormality appears to result from grafting. On the same estate, a large established Redcoat Grieve tree was also top-worked with Lambourne. This developed normal growth, but the fruits were all 'chats'. The scions were from normal trees. It appears, therefore, that the 'chat fruit' abnormality also results from grafting. As regards the normal grafting of healthy scions of Lord Lambourne directly on to rootstocks, it seems probable, in some stocks at least, that the abnormalities do not develop, but Malling XII is not above suspicion. In one plantation in Surrey, Lambourne on this stock has made large trees, but the fruits are of very poor size and quality, whereas trees on I and II have normal growth and bear fruits of normal size.

It is calculated that both conditions appear to be of virus origin and to have been brought about by grafting. Lambourne should not, for the present, be used for top-grafting. When propagating Lambourne directly on to rootstocks (or for any other purpose) buds and scions should be taken only from normal trees. Until more is known, it would be prudent to withhold the budding or grafting of Lord Lambourne on to Malling No. XII, and use Nos. I and II.

D'Oliveira (B.). **A Estação Agronómica e os problémas nacionais de fitopatologia.** [The Agronomic Station and the national problems of phytopathology.]—*Rev. agron., Lisboa*, xxx, 3, pp. 414–438, 1942–3.

Among the problems confronting Portuguese plant pathologists may be mentioned (besides those already noticed in this *Review*) the following. The remedy for the devastating epidemics of vine downy mildew [*Plasmopara viticola*], such as that of 1936, which result in widespread unemployment and other economic disturbances, lies in the development of resistant varieties.

Black rust of wheat (*Puccinia graminis*) [*R.A.M.*, xx, p. 455] causes an average annual reduction in yield of 10 per cent., while *P. glumarum* and *P. triticina* are each responsible for a decrease of over 5 per cent. In 1940, *P. coronata* decimated the oat crops, leaving a bare sufficiency of seed for the next season's sowing.

Virus diseases frequently infect over 60 per cent. of the seed of a bean crop, other sources of damage to which include *Uromyces appendiculatus*, anthracnose [*Colletotrichum lindemuthianum*], bacterioses, and fusarioses. *Botrytis* [*cinerea*] is among the limiting factors in broad bean cultivation. Thanks to the enterprise of Dr. Mathilde Bensaude, a start has been made on the production of potatoes from mass-selected healthy tubers. Breeding for resistance to disease is one of the major activities of the Station.

Marchionatto (J. B.). **Manual de las enfermedades de las plantas.** [Manual of plant diseases.]—368 pp., 159 figs., Buenos Aires, Editorial Sudamericana, 1944.

In 1942, one of the author's students, M. V. Fernandez Valiela, published a comprehensive treatise on phytopathology, with special reference to Argentina [*R.A.M.*, xxiv, p. 28]: in the present manual, therefore, no attempt has been

made to cover the same ground, the object being rather to provide more specialized information than to follow the curricula laid down by the Buenos Aires and La Plata Universities. The two first and longest chapters deal with bacterial and fungal diseases which, together with those caused by vascular parasites (Chapter III), are of major importance to producers. Chapters IV, V, and VI are concerned, respectively, with virus and physiogenic diseases and control measures. A short bibliography and a useful glossary are appended.

Chester (K. S.). **Defoliation and crop loss.**—*Plant Dis. Reptr.* xxix, 6, pp. 162-168, 1945. [Mimeographed.]

Measurement of crop yield reduction following artificial defoliation is a useful way of obtaining evidence of the extent of losses sustained by crops which have lost foliage as a result of disease or insect attack. Data from the literature relating to wheat, oats, barley, maize, flax, and onions have been combined with new matter, rearranged, and put into graphical form. In general, crop losses caused by artificial defoliation give a conservative estimate of those due to defoliation or loss of useful leaf area by disease. If a 20 per cent. crop loss is regarded as serious and demanding preventive measures, it is found that this loss, or much more, is registered if the plant is completely defoliated at any time during the greater part of its life or even if partly defoliated at mid-season. Thus, it is wrong to appraise a crop in mid-season as having a 'slight' or 'negligible' attack that showed a loss of 25 per cent. of leaf or useful leaf area at that time. There is a regular ratio between crop loss and loss of area, so that a control measure which reduces leaf disease without eliminating it has a decided value. There is a stage at which the effects of defoliation are most marked—the tassel stage in maize, wheat, and oats, the rosette stage in barley, and the bud stage in flax. *Septoria tritici*, for example, has been wrongly regarded as a pathogen of little consequence. Its effects are serious, for it destroys much leaf tissue at the most critical time. There are important secondary effects of leaf loss. In wheat the grain contains less protein and sugars, the 1,000-kernel weight is less and the flour is shown by tests to be inferior, while maturity is delayed by as much as 10 days, and this may result in further losses due to late season and disease.

Hopkins (C. Y.) & Coldwell (B. B.). **Surface coatings for rotproofing wood.**—*Canad. Chem. Process Industr.*, xxviii, 12, pp. 849–851, 1 fig., 1 diag., 1944.

A comparatively rapid method has been devised for determining the efficiency of surface coatings for the rot-proofing of wood, involving the use of very thin strips (yellow birch veneer, 0·01 in. in thickness in the tests described) offering a large surface area to the action of the fungi and bacteria occurring in profusion in the moist, warm (28±1° C.) composted earth in which ten strips are buried for 28 days after one minute's immersion in a preservative at room temperature. On removal from the soil, the specimens are washed under the tap, dried, and conditioned, and their breaking strength calculated as the percentage of that of ten similarly treated but unexposed strips. Ordinary varnish sealers failed to prevent decay and only slight protection was afforded by a heavier-bodied spar varnish, but properly formulated rot-proof coatings gave a high degree of protection for the period of the test. The permanence factor was studied in a series of tests in which the specimens were (*a*) exposed before burial to 'weatherometer' treatment, consisting of 96 hours' exposure to a carbon arc lamp and water spray, (*b*) heated in an oven at 105° for 48 hours, and (*c*) immersed in water (changed daily) for a week. The efficacy of three out of five preservatives was destroyed by the high-temperature treatment, while the 'weatherometer' rendered one of the coatings valueless; the effects of immersion were less serious.

Report on A.A.T.C.C. co-operative tests for determining mildew- and rot-resistance, November, 1943–July, 1944. Prepared by the Sub-Committee on Mildew Proofing.—*Amer. Dyest. Reptr*, xxxiv, 7, pp. P 128–135, 139–140, 6 graphs, 1945.

By July, 1944, reports covering one or more of the six mildew testing procedures adopted at the April, 1943, meeting of the Sub-Committee on Mildew Proofing of the American Association of Textile Chemists and Colorists had been received from 12 different laboratories of interested organizations. From this detailed, tabulated summary of the results of the co-operative experiments it appears that a reasonably practical evaluation of fungicidal treatments may be arrived at by the application of one or more of the testing methods, including at least one pure culture (of *Metarrhizium glutinosum*, *Chaetomium globosum*, or *Aspergillus niger*), and one soil contact (suspension or burial) test [cf. *R.A.M.*, xxiii, pp. 310, 450; xxiv, p. 159].

Frayer (J. M.). **Control of mold growth in composite milk samples.**—*Canad. Dairy J.*, xxiii, 8, pp. 25–26, 34, 1944.

In studies at the Vermont Agricultural Experiment Station the writer found that mould [chiefly *Oospora lactis*: *R.A.M.*, xxiv, p. 241] growth in composite milk samples is commonly first detected in the bottle stoppers. It may be effectively combated by thoroughly cleaning and scalding the bottles and soaking the well-cleaned stoppers overnight in a 50–50 formalin solution between each testing period. Rubber stoppers, being easier to sterilize, should be substituted for cork. Samples should be kept at a temperature not exceeding 50° in covered trays or boxes, preferably of metal, which must be cleaned and sterilized between testing periods. Mouldy composite milk samples may test too low and are hard to pipette. Sources of contamination include the milk itself, the sampler's hands and clothes, sample bottles, stoppers, and storage boxes, and from the refrigerator walls, ceilings, and air.

Foster (J. W.) & Karow (E. O.). **Microbiological aspects of penicillin. VIII. Penicillin from different fungi.**—*J. Bact.*, xlix, 1, pp. 19–29, 1945.

The anti-bacterial substances present in culture filtrates of *Aspergillus niger* YW, *A. nidulans*, *A. oryzae* TP, *A. flavipes*, and *Penicillium citreo-roseum* were shown by experiments on their solubility properties, stability in regard to heat and P_H, anti-bacterial spectra against 18 bacteria, destruction by the enzyme penicillinase (*J. Bact.*, xlix, pp. 7–17, 1945), and efficacy in the protection of mice against *Diplococcus pneumoniae* Type 1 to be either identical with, or closely related to, authentic penicillin produced by *P. notatum*. Substrains superior in penicillin-yielding capacity to the parent culture of *A. oryzae* were isolated. The optimum temperature for growth and penicillin production was 37° C. for *A. oryzae* and 25° for the other species under observation. Kojic acid was more effective in the inhibition of the Gram-negative than in that of the Gram-positive organisms tested.

Peterson (W. H.), Snell (J. F.), & Frazier (W. C.). **Fodder yeast from wood sugar.**—*Industr. Engng Chem.*, xxxvii, 1, pp. 30–35, 1945.

About 150 fermentations of hydrolysates from 13 species of wood with nine types of yeast were run and the yields of yeast determined at the United States Forest Products Laboratory, Madison, Wisconsin. Pre-treatment of the hydrolysate was found to be necessary to ensure good yields, and the best of the four procedures tested involved the following steps, the quantities of materials being based on 5 to 6 per cent. reducing sugar. Calcium carbonate was added (0·75 gm.

per 5 gm. reducing sugar) to adjust the P_H to 5, and after the admixture of 0·05 per cent. sodium sulphite the solution was heated to boiling, cooled, and filtered through a pad of hy-flo supercel. Then 0·06 gm. urea and 0·05 gm. potassium dihydrogen phosphate per gm. reducing sugar were added and the solution diluted to the desired concentration for fermentation.

Torula [*Torulopsis*] *utilis* No. 3 [cf. *R.A.M.*, xxiii, p. 494], *Candida tropicalis*, and an unidentified yeast gave the most promising results in preliminary trials, and the first-named, by reason of its well-known nutritive properties, was selected for use in the subsequent experiments. Acclimatization of the yeast to wood sugar increased the yield, which was further affected by the composition and hydrogen-ion concentration of the medium, temperature, rate of aeration, and time of fermentation. Within the limits tested, conversion of carbohydrate to cells increased in efficiency with increasing aeration. In bottles complete fermentation was obtained in 16 hours with the standard inoculum level and a temperature of 30° C., but the time could be reduced by raising the inoculum to higher levels (5 to 6 gm. per l., dry weight) and the temperature to 34° or 35°. Adjustment of the initial P_H to a range of 4·5 to 5·5 resulted in suitable conditions for yeast production. Yields (calculated as dry yeast) of 35 to 40 per cent. of the total reducing sugar in the hydrolysate were secured regularly. About 90 per cent. of the apparent reducing sugar was fermented, the remainder being probably unfermented pentoses and non-sugar-reducing substances. Hydrolysates from spruce and southern yellow pine [*Pinus* spp.] gave good fermentations, but those from Douglas fir [*Pseudotsuga taxifolia*] were very difficult to ferment. The wood sugar from maple [*Acer*], yellow birch, and beech yielded equally well with the hydrolysates from the best softwoods.

Stubbs (J. J.), Noble (W. M.), & Lewis (J. C.). **Fruit juices yield food yeast.**—*Food Industr.*, xvi, 9, pp. 68–70, 125, 1 fig., 1944.

A tabulated account is given of the procedure employed at the Western Regional Research Laboratory, Albany, California, for the production of *Torulopsis utilis* [see preceding abstract] from fruit syrups or concentrates of prunes, figs, and raisins and press juices of apples, pears, and peaches. Yields of 42 to 58 gm. dry yeast per 100 gm. sugar were obtained in the laboratory-scale fermenters, while those from prune syrup in pilot-plant equipment were somewhat higher. The protein content of the yeast, calculated from the nitrogen content, was shown to range from 53 to 58 per cent., and assays reported for eight members of the vitamin B group correspond to published values for unfortified brewers' and bakers' yeasts.

Sciarini (L. J.) & Wirth (J. C.). **Ethanol production from wheat hydrolysates and stillage by yeast and Fusaria.** *Cereal Chem.*, xxii, 1, pp. 11–21, 1945.

By the application of a pentose fermentation with spore-mycelial suspensions of *Fusarium lini* from a synthetic medium to sulphuric acid-hydrolysed dark northern spring wheat mashes, an increased yield of alcohol was obtained amounting to 6 to 12 per cent. more than derived from a compressed bakers' yeast fermentation of the hexoses [cf. *R.A.M.*, xxiv, p. 67]. By the application of acid hydrolysis to industrial plant stillage, comprising dextrins, hexoses, and pentoses, an additional yield of about 13 per cent. alcohol was secured by yeast fermentation.

Magrou (J.) & Mariat (F.). **Action de l'aneurine sur le développement des embryons d'Orchidées.** [The action of aneurin on the development of Orchid embryos.]—*Ann. Inst. Pasteur*, lxxi, 1–2, pp. 49–51, 1945.

In experiments on the growth of *Cattleya* embryos on Knop's agar plus 20 per mille saccharose, the addition of aneurin (vitamin B_1) at a concentration of 1·86 γ

per c.c. markedly stimulated the development and differentiation of the young plants [cf. *R.A.M.* xxiv, p. 200]. Thus, on 8th December, 1943, three months after sowing, the average diameter of the plants in the tubes enriched with the vitamin was $592 \pm 13\mu$ compared with $458 \pm 12{\cdot}6\mu$ for the controls. At the age of four months nearly all the plants supplied with the growth substance had produced a well-developed bunch of leaves, whereas most of the controls were still in the spherule stage. The green coloration of the treated embryos, moreover, was much brighter than that of the untreated.

Campbell (W. A.) & Presley (J. T.). **Design for constant temperature tanks.**—*Phytopathology*, xxxv, 3, pp. 213–216, 2 diags., 1945.

Details are given of the construction of modified constant-temperature tanks, modelled on those originally developed at the University of Wisconsin [*R.A.M.*, vi, p. 366], for studies on the relation of soil temperatures to the infection of guayule [*Parthenium argentatum*] by soil fungi at Salinas, California.

Aspergillus niger.—*Aust. J. Sci.*, vii, 2, p. 54, 1944.

The United States Department of Agriculture is using *Aspergillus niger* as the basis for a rapid, precise, and economical method of determining the presence or absence in the soil of the rarer elements essential to plant growth. The mould's mineral requirements are identical with those of green plants, except that it needs no calcium, silicon, or boron. According to R. A. Steinberg, experiments have shown that a few parts per million or per billion of such elements as zinc, copper, and molybdenum are as important to the growth of *A. niger* [cf. *R.A.M.*, xxi, p. 35] as much larger quantities of the more familiar plant foods, potassium and phosphorus. The mould thus serves as an index in particular cases to the presence or absence of any of these micronutrients, which are as indispensable to field, garden, and greenhouse crops as they are to *A. niger*.

Epps (W. M.). **Purple-top wilt of Potatoes.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 363–365, 1943.

Field and greenhouse studies carried out from 1939 to 1941 on purple-top wilt of potatoes [*R.A.M.*, xxiv, p. 70] showed that, in addition to the 22 New York weeds previously listed as suspects, 20 others were susceptible. Three of these were found naturally diseased in the field. Since its description by Muncie in Michigan in 1932 under the name of 'moron' disease [ibid., xii, p. 188], it has been reported from California, North Dakota, Minnesota, Wisconsin, West Virginia, Maryland, Pennsylvania, New York, and Maine; the disease recorded from Alberta as 'purple dwarf' [ibid., xx, p. 318] is probably the same.

The direct loss in yield is often serious, especially if the plants become infected before the tubers reach marketable size. This loss, however, is often only of secondary importance compared with the reduction in cooking quality, and the loss of market value caused by the internal necrosis of the tuber. The sprouts from tubers on affected plants are often weak and slender, with the result that such tubers are unfit for seed purposes. The disease is, however, of minor importance except in certain parts of Pennsylvania and West Virginia, where it is one of the chief factors limiting potato production.

Experimental evidence demonstrated that the disease is caused by the New York aster-yellows virus [ibid., xxii, p. 269]. Little difficulty was experienced in producing the disease on potatoes by means of insect inoculations, but all attempts to transfer the virus directly from a diseased potato to a healthy aster by means of previously non-infective aster leafhoppers (*Macrosteles divisus*) were failures, although these insects successfully transferred the virus to asters from *Nicotiana rustica* plants on which scions from diseased potato plants had been grafted.

The aster-yellows virus overwinters on various perennial and biennial weeds, of which the most important are the ox-eye daisy [*Chrysanthemum leucanthemum*] and the broad-leaf plantain [*Plantago major*].

The incubation period in the potato plant varies with the time of year and the variety. It is shorter in summer and longer in winter; in the Katahdin variety in late spring it is about 26 days, or about 10 shorter than in Green Mountain and Russet Rural.

Control measures recommended include roguing, planting seed obtained only from unaffected fields, increasing the seeding rate to allow for weak sprouts and poor stands, separating the potato field from weed areas or destroying weeds adjacent to it, early planting, and the use of resistant or tolerant varieties.

Peterson (L. C.). **Studies on the late blight of Potatoes and its causal organism, Phytophthora infestans (Mont.) de Bary.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 380–382, 1943.

When potato seed experimentally inoculated with *Phytophthora infestans* was planted 10 per cent. produced diseased aerial shoots. Seed planted within an inch of inoculated tubers gave only disease-free plants. The rate of sporulation became greatly reduced within three weeks from the date of tuber-planting. The rapid spread of a species of *Fusarium* and soft-rot organisms over blight lesions on seed pieces is an important factor in limiting the duration of sporulation.

Various Solanaceous plants known to grow wild on Long Island, as well as representative members of the family grown in gardens, were tested as possible overwintering suscepts. Most of the perennials inoculated were highly resistant, but *Atropa belladonna*, egg plant, and *Solanum dulcamara* were susceptible. Sporulation could be induced only on lesions on the last-named which was, however, found infected in nature.

A comparison of the growth rates of *P. infestans* showed that growth was more rapid on Lima bean agar than on maize meal or oatmeal agars.

In a study of the factors promoting growth on Lima beans, it was ascertained that growth on a synthetic medium to which a water extract of Lima beans had been added was almost as good as that on Lima bean agar. This factor was dialysable, destroyed by autoclaving for one hour at P_H 10, and relatively unaffected by autoclaving at P_H 4 or 7.

Further studies showed thiamin to be an important factor for the good growth of *P. infestans* on Lima bean agar. The addition of 1 mg. ascorbic acid and of 0·5 mg. thiamin chloride to 100 c.c. potato dextrose agar gave excellent growth, but the addition of these vitamins to Lima bean agar failed to increase the growth.

Blodgett (E. C.). **Water rot of Potatoes.**—*Plant Dis. Reptr*, xxix, 4, pp. 124–126, 1945. [Mimeographed.]

Water rot of potatoes, a new popular name used for a well-known disease occurring in Idaho, was at one time thought to be of a physiological nature, caused by lack of aeration and excessive moisture followed by secondary infection. The writer believes that moisture and temperature are predisposing conditions, but that the pathogen is *Phytophthora erythroseptica*, which was isolated repeatedly from typical samples and identified by Dr. Ray and Dr. C. M. Tucker. Evidence showed that most infection occurs in the field (up to 50 per cent. of the crop may show symptoms at digging) and not in storage, and tuber transmission and the build-up of inoculum in the soil are very important. Although wet, heavy soil and heavy manure of sheep and lucerne naturally predispose the soil to infection, the disease is also known in sandy soils and is on the increase. Typical water rot resembles frost injury. The outer tissue near the stem end darkens and assumes a water-soaked appearance. The inner rotted tissue is a creamy-white at first,

darkening later. A characteristic symptom is a slipping of the skin. Affected cut tubers turn pink in the air. It is not known whether the foul odour of fermentation is due to the above-mentioned fungus or to secondary organisms. The importance of the disease in Idaho and its future potentialities suggest that more information is desirable and perhaps necessary in order to prevent serious losses.

Person (L. H.). **Pathogenicity of isolates of Rhizoctonia solani from Potatoes.**—*Phytopathology*, xxxv, 2, pp. 132–134, 1945.

In recent studies at the Louisiana Agricultural Experiment Station on the pathogenicity of *Rhizoctonia* [*Corticium*] *solani* to beans [*R.A.M.*, xxiv, p. 88], none of the isolates from potato attacked the test plants. In additional inoculation tests on beans with 101 cultures from sclerotia on potato tubers and 29 from potato stem lesions, only three of the former were slightly injurious, while ten of the latter proved to be pathogenic (nine actively so). Two bean and two sugar beet isolates used as controls caused severe damage. In similar experiments on potatoes with 70 cultures, five were strongly pathogenic, 13 and 35 moderately and slightly so, respectively, and 17 caused no injury. The bean and sugar beet controls produced intermediate effects. Of the three cultures from sclerotia on tubers that had been pathogenic to beans, one was innocuous and two only slightly injurious to potatoes.

Decker (P.). **A study of the pathogenicity of some Actinomyces from the soil.**—*Abstr. Thes. Cornell Univ., 1942*, pp. 358–360, 1943.

In greenhouse pathogenicity studies, 116 different cultures of *Actinomyces* from potatoes [cf. *R.A.M.*, xviii, p. 412], 8 from beets, and 3 from carrots, together with 65 named cultures [of *Actinomyces*] were increased on potato dextrose agar in Petri dishes and washed into sterilized pots of soil when potato seed pieces of the Green Mountain and Cobbler varieties were planted.

The morphological character of acid-fastness used by Taylor was perfectly correlated with the physiological character of starch hydrolysis. A larger percentage of the non-acid-fast than of the acid isolates produced a russeted injury, but this character could not be correlated with pathogenicity. The presence or absence of a dark brown surface ring on milk separated the isolates into two groups, with 66 positive and 79 negative. All the members of the positive group were pathogenic to potatoes, but none of the negative group produced typical scab lesions.

Pathogenic and non-pathogenic cultures were obtained from a single scab lesion on the potato tuber. Several isolates from beet were pathogenic to potato. Pathogenicity tests in the greenhouse were more severe than natural infection in the field, particularly with later-maturing varieties. Certain U.S.D.A. seedlings and the Hindenburg variety, normally resistant in the field, were moderately susceptible in the greenhouse.

A factorially designed experiment was carried out under greenhouse conditions to determine the influence of various factors on the development of scabbed tubers. Watering through the aperture in the bottom of the pots was more satisfactory for scab development than watering from the top. Spread of the causal organism by water splashed from one pot to another did not occur, neither were the fungi air-borne.

C[ardenas] (M.). **La Phytophthora infestans en Cochabamba.** [*Phytophthora infestans* in Cochabamba.]—*Rev. Agric., Cochabamba*, ii, 4, p. 41, 1944.

For two years in succession potato late blight (*Phytophthora infestans*) has occurred in the Department of Cochabamba and other districts of Bolivia, as well as in Cuzco, Peru. Wild species growing in the environs of the city of Cochabamba

have shown equal susceptibility with the cultivated, so that the elimination of the pathogen is likely to prove impracticable. The tubers appear to be relatively resistant, unlike the foliage which is completely destroyed by the disease. The development of varieties resistant to the local strains of *P. infestans* is recommended.

Sleeth (B.). **Pre-emergence damping-off control in Guayule with phenyl mercuric fungicides.**—*Plant Dis. Reptr*, xxix, 5, pp. 139–140, 1945. [Mimeographed.]

Phenyl mercuric salicylate (mersolite 19) at dosages of 0·1, 0·2, and 0·3 per cent., and phenyl mercuric acetate (mersolite 8) at 0·1, 0·3, and 0·5 per cent., applied to guayule (*Parthenium argentatum*) seed, effectively controlled damping-off (*Pythium ultimum*), and permitted 80 to 86 per cent. seedling emergence, compared with 3·2 per cent. in the control rows, the next best result (67·2 per cent.) being secured with 4 per cent. phenyl mercuric chloride (mersolite 2) in bentonite clay at a dosage of 1 per cent.

Wallace (T.). **Diagnosis of mineral deficiencies in crop plants.**—*Nature, Lond.*, clv, 3937, pp. 444–446, 1945.

This is a summary of two lectures delivered at the Royal Institution on 30th January and 6th February, 1945, embodying in an abridged form the information on the diagnosis of mineral deficiencies in crop plants already presented from another source [*R.A.M.*, xxii, p. 406].

Gilman (J. C.). **A manual of soil fungi.**—392 pp., 135 figs., Ames, Iowa. The Collegiate Press Inc., 1945. $5.00.

This volume is a revised and greatly enlarged edition of 'A summary of the soil fungi' published by the author and E. V. Abbott in 1927 [*R.A.M.*, vii, 57]. It is designed to place a tool in the hands of investigators that will enable them to identify the soil fungi which they may encounter in the course of their work. The book does not profess to contain much new information, the author's primary object having been to assemble the descriptions of fungi isolated from the soil in pure culture. The body of the treatise presents a key to the classes, orders, and families of soil fungi and full descriptions (frequently reprinted from standard works) of each organism recorded, while other features are references to their geographical distribution and a bibliography of 169 titles, glossary, and index.

Martin (J. P.). **Microorganisms and soil aggregations: I. Origin and nature of some of the aggregating substances.**—*Soil Sci.*, lix, 2, pp. 163–174, 1945.

Two soil microbes, a fungus of the genus *Cladosporium*, and an aerobic bacillus, apparently related to the *Bacillus subtilis-mesentericus* group, were found to effect marked aggregation of the silt and clay particles of the soil at the Idaho Agricultural Experiment Station. In the case of the fungus, the conglomeration was brought about in approximately equal measure by cellular substances and the binding influence of the mycelium. The active aggregating material, consisting in the main of a hemicellulose-like polysaccharide synthesized by the soil bacillus, was only slightly attacked by fungi (*Aspergillus niger*, *Penicillium* sp., and *Rhizopus nigricans* [*R. stolonifer*]) in culture experiments, but was readily destroyed by certain bacteria and *Actinomyces coelicolor*. Evidently, therefore, its contribution to enhanced soil aggregation is likely to be only temporary.

Keyworth (W. G.). **Three important Hop diseases.**—*J. Minist. Agric.*, li, 12, pp. 556–561, 3 figs. (facing p. 555), 1 map, 1945.

During the past 20 years, hop *Verticillium* wilt [*V. albo-atrum* and *V. dahliae*: *R.A.M.*, xxiv, pp. 137, 153], nettlehead [ibid., xxii, p. 38], and mosaic [ibid., xxiii,

p. 2 and next abstract] have become increasingly important in Britain, where they now constitute a major problem. A special investigation, started in 1938, has shown that, contrary to the view commonly held hitherto, the mild or fluctuating type of *Verticillium* wilt is very widely distributed. This form of the disease has been reported from Kent, Sussex, Herefordshire, and Worcestershire. There is, however, no danger of any wholesale attack on the crop. This fluctuating type of wilt was first discovered by R. V. Harris in 1924 in a hop garden at Penshurst, Kent, since when the total effect on the crop has been virtually negligible. In other affected gardens no wilting has been noted, the only visible symptom being thickened bines on scattered hills. Some of the outbreaks have been traced to earlier potato crops, others to the planting of infected sets, while many are of such long standing that their origin is unknown.

The most important feature of the quite distinct and really dangerous form of wilt known as the progressive type is that affected hills do not recover. The first outbreak was found on a farm near Paddock Wood, Kent, in 1933; it had then been in existence a year or two. In 1934, the disease was found on five other farms in the vicinity. Since then, it has virtually ruined these farms, and has spread to about 50 others in a radius of about ten miles. It is in this comparatively limited area that the greatest danger from the disease exists; local growers should watch carefully for early signs of the trouble, and promptly remove affected hills. In other localities, the use of wilt-free planting material is advised. The Ministry of Agriculture's scheme for certifying wilt-free gardens will help to prevent further spread of either form of the disease. In addition, it is hoped that even badly affected farms may be brought back into production by the use of resistant varieties.

The virus diseases, nettlehead and mosaic, occur in all hop-growing areas. Nettlehead, while most prevalent in the Fuggle variety, attacks all varieties, while mosaic affects Golding only, and is therefore particularly important in Worcestershire and eastern Kent. Against nettlehead the best plan is to begin the removal of infected hills very early in the season, before the bines are trained, so that the hills can be picked out by their stiff bines and up-curled leaves. The cumulative and widespread losses from nettlehead make it the greatest single cause of loss to the hop industry as a whole. In young gardens, not only must obviously infected hills be removed, but also those showing only slight symptoms; as an added precaution in small outbreaks, all hills adjoining affected ones should be removed also. New gardens should be planted with disease-free stock only.

Mosaic carrier varieties, such as Fuggle and the Wye Seedling hops, should always be sown some distance away from Golding. It has recently been discovered that some male hops also act as carriers. Roguing and the planting of clean stock are as important against mosaic as they are against nettlehead.

Smith (K. M.). **A further note on the viruses affecting Atropa belladonna and a description of a virus complex attacking Hyoscymus niger.**—*Parasitology*, xxxvi, 3–4, pp. 209–210, 1 pl., 1945.

An account has already been given of an undescribed virus affecting *Atropa belladonna* [*R.A.M.*, xxii, p. 451]. Further studies on this plant, which is widely grown on herb farms in the British Isles, have shown it to act as a symptomless carrier of *Hyoscyamus* virus 1 [henbane mosaic virus: ibid., xii, p. 243]. Inoculated into various species of *Nicotiana*, the latter virus induced the development of very clear, discrete, local lesions, especially in *N. sylvestris*, *N. langsdorffii*, and *N. rustica*, usually followed by systemic necrosis and death of the plants. The reaction of *Nicandra physaloides* appears to be wholly necrotic, all the middle and lower leaves being killed; no mottling was observed. The symptoms developing on tomato were those of an extremely severe streak disease, which was uniformly fatal to plants wintering in the greenhouse but assumed a milder form under

summer conditions. Seed from summer-grown fruits bearing ring-shaped necroses gave rise to healthy plants.

A spontaneously occurring, very destructive virus complex attacking *H. niger* was shown by inoculation experiments on tobacco, *Datura stramonium*, turnip, and stock (*Matthiola*) to consist of potato virus X and *Brassica* virus 1 [cabbage ring spot virus: ibid., xiv, p. 669]. In the course of the investigations the former virus was observed to form local lesions on the cotyledons of ridge cucumber without systemic infection, while the latter provoked similar reactions in *Nicotiana sylvestris*.

Asthana (R. P.) & Mahmud (K. A.). **A new bacterial leaf-spot on Piper betle.**—*Curr. Sci.*, xiv, 3, p. 73, 1945.

A hitherto undescribed leaf spot was observed on the Bangla variety of *Piper betle* at Ramtek, Central Provinces, India, during December, 1943. Diminutive, pale yellow spots, rapidly turning dark purple, appear on, along, or between the veins on either leaf surface, those in the former positions being roughly circular or angular, while in the latter they are irregularly elongated or branched like fern leaves. Only in cases of advanced decay are the lesions, measuring 1 mm. to 1 cm. in width, visible on both surfaces. The infected foliage gradually turns yellow and falls.

Inoculation experiments on leaves of the Bangla and Kapuri varieties with bacterial suspensions or smears were successful, and the pathogen was recovered from the infected tissues. The organism attacks chiefly the parenchymatous cells, which slightly expand, assume a dark yellow tinge, and disintegrate. In the early stages it is confined to the epidermis, but subsequently invades the spongy and palisade parenchyma, while the phloem and xylem may be penetrated in the final phase. Two or three spots suffice to destroy a leaf, entry to which is effected through the stomata or directly through the epidermal wall.

The white colonies initially produced by the organism on bouillon agar plates turn maize yellow in 12 to 18 hours: they are round, thin, flat, glistening, and furcate, dry and brittle in texture. An outer ring and a lobate margin surround the well-defined central area, the lobes occasionally branching out in the semblance of a fern and appearing fan-shaped. The agent of the leaf spot is a rod-shaped bacterium, 2·5 by 1·2μ, occurring in pairs or chains of 3 to 12 or more cells, actively mobile, forming at 30° to 38° C. a profusion of spores which resisted ten minutes' heating at 90°. These characters place the organism in an entirely different category from *Bacterium betle* [*R.A.M.*, vii, p. 741], and it is therefore presumed to be a new species, to which the name of *Bacillus betle* is provisionally assigned.

C[ardenas] (M.). **La 'estalla de la Coca'.** [The 'splitting of Coca'.]—*Rev. Agric., Cochabamba*, ii, 4, pp. 41–43, 1944.

Various theories have been advanced in explanation of the so-called 'splitting' of coca [*Erythroxylon coca*] in Bolivia, a disorder characterized by the transformation of the leaves into aggregations of minute, squamous structures, similar to those developing in cases of witches' broom. It was suspected, for instance, that *Marasmius perniciosus*, the agent of witches' broom in cacao, might also be implicated in the coca disease under observation, but hitherto microscopic and cultural studies of the affected material have given negative results. Other possible agencies of the trouble are a virus or physiological or genetic factors, and further investigations along these lines are necessary before a definite statement concerning the etiology of 'splitting' can be made.

Crandall (B. S.) & Davis (W. C.). **Phytophthora wilt and stem canker of Cinchona.**—*Phytopathology*, xxxv, 2, pp. 138–140, 1 fig., 1945.

Previous reports of *Phytophthora* infection on *Cinchona* appear to have referred

exclusively to seedlings, and the authors also observed the disease on plants in this phase in Puerto Rico. In Guatemala, Colombia, and Peru, however, not only seedlings but also grafted stock and plantation trees at varying stages of maturity were found to be affected. The first symptoms on seedlings are ill-defined, brown, necrotic spots on the leaves, through the bases of which the fungus may traverse the petiole and enter the stem, killing the plant. On older grafted stock and young plantation trees elongated, slightly depressed cankers and die-back develop on the more succulent branches, and in some cases the terminal portion of every branch is destroyed, leaving clusters of brownish-black, dead leaves. The species of *Cinchona* attacked were *C. pubescens* (*C. succirubra*), *C. officinalis*, and the Ledger form of the latter in Guatemala, *C. pubescens* and *C. pitayensis* in Colombia, and *C. officinalis* (Ledger) in Peru.

From the leaves, petioles, and stems of the last-named a fungus tentatively determined as *P. parasitica* was isolated, and positive results were given by inoculation experiments on both wounded and unwounded material. This appears to be the first record of *P. parasitica* on cinchona and the first report of *Phytophthora* blight of the host in question in the western hemisphere. In other countries the disease has been variously attributed to *P. palmivora* (Philippines and India) [*R.A.M.*, xiii, p. 813; xv, p. 410] and *P. cinchonae* (Japan) [ibid., xvi, p. 408].

The eradication of wilted seedlings from the beds seems to have given a measure of control in Peru, while in Guatemala a considerable amount of material was saved by cutting back the tops of diseased grafted stock to well below the dead tip. Wherever the blight was observed, individuals and certain clonal lines gave evidence of resistance, and it is thought probable that selections combining a high alkaloid content with the capacity to withstand infection may be developed.

McMartin (A.). **Germination and yield in Sugarcane agriculture. A case for disinfection and protection of cuttings.**—*S. Afr. Sug. J.*, xxix, 1, p. 21, 1945.

In an experiment in Natal in which the treatment of sugar-cane cuttings against soil pathogens, notably *Ceratostomella paradoxa* [*R.A.M.*, xxiv, p. 249], was combined with the application of a fertilizer to the soil, the increase in yield due to the latter alone was 3 per cent., the corresponding figures for ceresan alone, the same plus fertilizer, and agrosan with and without fertilizer being 24, 31, 18, and 43 per cent., respectively. The results of a greenhouse experiment showed that the response to such treatment was enhanced in dry soil, an important consideration under local conditions.

McMartin (A.). **Sugarcane smut: reappearance in Natal.**—*S. Afr. Sug. J.*, xxix, 2, pp. 55, 57, 2 figs., 1945.

The attention of cane-growers is directed to the reappearance in Natal of smut (*Ustilago scitaminea*) [*R.A.M.*, xxiv, p. 166] on a few stools of C. 301. The disease was first observed in the country in 1877, and following energetic action by a committee of the Victoria Planters' Association, who issued a report on the subject in 1882, it was ultimately extirpated by the complete eradication of the susceptible China variety and the digging-out of infected stools of the more resistant types. Alternate hosts in Natal include *Imperata arundinacea* and *Erianthus saccharoides*. The available information on the distribution, symptoms, sources and modes of infection, virulence, and control of smut is briefly summarized.

Dymond (G. C.). **Cure of streak disease in Uba Cane.**—*Proc. Congr. S. Afr. Sug. Technol. Ass.*, xviii, pp. 83–85, 1944. [Abs. in *Sugar*, xl, 4, pp. 49–50, 1945.]

Seed pieces of Uba cane with about 60 per cent. streak disease infection were planted [? in Natal: *R.A.M.*, xxiii, p. 148] in a soil dressed with a moderate amount of compost. During the next two years there was no increase in the

incidence of infection, whereas the standing cane from which the seed pieces were taken developed 100 per cent. After the second cutting the ratoons were surface-dressed with fresh compost. By the end of the third year the number of diseased canes had fallen to 25 per cent. or so, and an examination during the fourth year revealed complete absence of streak. The healthy canes were then transplanted into a composted seed-bed adjacent to a severely infected planting and had developed no streak when inspected after six months. Soil fertility, consisting in this instance of an abundance of organic matter, would thus appear to be a contributory factor in the health of the canes, enabling them to recover from an otherwise fatal disease.

Abbott (E. V.) & Sass (J. E.). **Pathological histology of Sugarcane affected with chlorotic streak.**—*J. agric. Res.*, lxx, 6, pp. 201–207, 3 pl., 1945.

A study was made of the pathological histology of the buds, leaves, and stems of C.P. 29 320 sugar-cane affected by chlorotic streak in Louisiana [*R.A.M.*, xxiii, p. 500]. Some of the axillary buds from diseased stalks showed no histological abnormalities, while in others necrosis of the epidermis and mesophyll was present to a varying extent.

Development of the typical streaks on the leaves was accompanied by noticeable reductions in the number, size, and reaction to staining of the chloroplasts in the mesophyll and chlorophyll-bearing bundle-sheath cells. When necrosis occurred in these streaks, it originated in the mesophyll and involved the vascular bundles only after the mesophyll tissue had undergone extensive disintegration. In diseased leaves presenting a 'scalded' appearance, but lacking the distinctive streaks, thickening of the walls and gummosis sometimes proceeded in the xylem and phloem in advance of, or simultaneously with, comparable degeneration in the mesophyll.

Sporadic necrosis of the stem parenchyma tissue was observed. Gummosis was the sole abnormality of the conductive elements, the gum-like substance being either completely amorphous, somewhat striated and minutely granular, or aggregated into spherical or teardrop-shaped globules.

Spherical intracellular bodies staining deeply with safranin and iron-alum haematoxylin were detected in the stems and foliage of infected plants. Some of them were provided with a pellicle-like covering suggesting a wall, but their contents were homogeneous, with no indication of nuclear structure. Accumulations of a gelatinous substance, frequently simulating organized bodies, were present in the stems of some diseased plants. They were soluble in ether, xylol, dioxane, and chloroform, but not in ethyl alcohol, and stained brilliantly with Sudan III, denoting a fatty chemical basis. The various forms of gummosis and the bodies exhibiting some degree of structural organization are believed to be products of a disordered metabolism rather than agents of chlorotic streak.

Pinto Lopes (J.). **Contribuïção para o estudo dos Basidiomicetas portugueses. I–III.** [Contribution to the study of the Portuguese Basidiomycetes. I–III.] – *Brotéria*, xiii, 4, pp. 230–238, 1944; xiv, i, pp. 5–13, 1 fig., 1945.

Included in this critically annotated list of Portuguese Basidiomycetes (Part II of which was published in *Bol. Soc. broteriana*, Sér. 2, xvi, [pp. 215–225], 1942) are a number of wood-destroying fungi. Mention may be made in particular of *Polyporus betulinus* on birch, of which this is the first record for Portugal.

Merrill (E. D.) & Walker (E. H.). **A bibliography of Eastern Asiatic botany.** – xlii+719 pp., The Arnold Arboretum of Harvard University, Jamaica Plain, Massachusetts, 1938.

Included in this bibliography, covering China, Japan, Formosa, Korea, Manchuria, Mongolia, Tibet, and eastern and southern Siberia, and also comprising

outstanding published papers relating to adjacent areas, such as the Philippines, Indo-China, Siam, Burma, India, and central and northern Asia, are sections on plant pathology (p. 607) and fungi (pp. 629–636), both indexed by G. D. Darker.

Pruthi (H. S.). **Leaf-curl disease of Tobacco in India.** —*Indian Fmg*, v, 5, pp. 220–223, 2 pl., 1 diag., 1945.

Much of the information in this progress report on tobacco leaf curl in India, where investigations on this economically very important disease have been proceeding for the last six years at the Imperial Agricultural Research Institute, Pusa, has already been presented from other sources [*R.A.M.*, xxiv, p. 122]. It may be of interest, however, to note the following points. The disorder is most prevalent in the Gangetic Delta, comprising Bihar in the east and Sind and Baroda in the west, where it may assume an epidemic form, involving 60 to 70 per cent. or more of the crop, the cigarette varieties being particularly susceptible. Five types of symptoms [which are illustrated but not described] have been observed and are designated A, B, C, D, and X, the last-named being a mixture of two or more of the others. It is not yet known whether each type is caused by a specific virus, but they are all transmissible by the white fly *Bemisia tabaci*. There is some prospect of reducing the insect population to a minimum, and so decreasing the large-scale development of the leaf-curl virus, by spraying or dusting the crop at ten-day intervals for two months, beginning in the seed-bed.

Bawden (F. C.) & Pirie (N. W.). **The liberation of virus, together with materials that inhibit its precipitation with antiserum, from the solid leaf residues of Tomato plants suffering from bushy stunt.**—*Brit. J. exp. Path.*, xxv, 2, pp. 68–80, 1944.

After the sap was expressed from minced Kondine Red tomato leaves infected by the bushy-stunt virus [*R.A.M.*, xxii, p. 458], the solid residues were found to contain about the same amount of virus as the sap. Liberation of the infective principle is best effected by incubating the residues for 15 hours at 42° C. with a commercial preparation of trypsin (0·1 per cent.) and then passing them through a roller mill, a certain proportion, however, being released by either procedure alone.

Purified preparations of virus from the sap and solid residues possess similar properties. Extracts of milled fibre contain some virus combined with chromoprotein to form a non-precipitating antigen; they do not precipitate with virus antiserum until the chromoprotein has been removed. Non-precipitating complexes of virus and chromoprotein can be formed by milling fibre of healthy plants to which purified virus is added. Extracts of fibre from healthy and diseased leaves incubated with trypsin contain material that inhibits bushy-stunt virus precipitation by its antiserum.

Smith (K. M.). **Black ring disease of the Tomato.**—*Gdnrs' Chron.*, Ser. 3, cxvii, 3043, pp. 170–171, 1 fig., 1945.

Attention is drawn to the occurrence [? at the Plant Virus Research Station, School of Agriculture, Cambridge] of a new virus, inducing on young tomato leaves numerous small, black, coalescent rings which spread to the growing point and destroy it. At the same time, dark reddish streaks develop on the stem and petiole, the former sometimes also bearing black rings. The disease is fatal to young tomato plants. In its wide host range the new virus resembles tomato spotted wilt, the plants attacked including cucumber, French bean, *Primula obconica*, and nasturtium (*Tropaeolum*) [*majus*]. The mode of spread of the virus has not yet been ascertained. Further information on the distribution of black

ring is required, and growers are invited to submit specimens of suspected material for identification.

Middleton (J. T.). **Noninfectious mosaic pattern of Tomato.**—*Plant Dis. Reptr*, xxix, 5, p. 141, 1945. [Mimeographed.]

Inoculation experiments on cucumber, tobacco, and tomato with juice from tomato leaves from Orange County, California, suspected of infection from tobacco mosaic gave negative results. The supposed disease was confined to restricted areas over which sodium chlorate had been applied for bindweed (*Convolvulus arvensis*) control, and the chemical was evidently responsible for the symptoms, which consisted of stunting and chlorosis of the plants, with marked mottling and distortion of the foliage. As the interval between the treatments and tomato culture increased, these symptoms became progressively milder, but the spurious mosaic pattern was still discernible on plants grown on land to which sodium chlorate had been applied five years earlier.

Henderson (R. G.). **Testing of copper fungicides for control of Tomato blight in Southwest Virginia.**—*Tech. bull. Va agric. Exp. Sta.* 89, 18 pp., 3 graphs, 1943.

A full account is given of spraying and dusting tests carried out in south-western Virginia in 1941 and 1942 with copper oxide dust (containing 5·1 per cent. metallic-copper in 1941 and 4·1 per cent. in 1942), copper oxide spray (yellow cuprocide 1½ lb. per 100 gals.), tribasic copper sulphate dust, tribasic copper sulphate spray (both from the Tennessee Copper Company), and Bordeaux mixture 4–4–50 used as a spray against blight (due primarily to *Alternaria solani*, though in some cases infections by this fungus appear to be initiated by *Septoria lycopersici* and *Phytophthora infestans*) of Earliana (early), Pritchard (medium-early), and Marglobe (late) tomatoes [cf. *R.A.M.*, xxii, p. 157 and next abstract].

In 1941, when the season was dry during August and September, Earliana and Pritchard responded very favourably to the treatments, but Marglobe gave a greatly reduced yield as a result of the drought conditions, and the treatments failed to increase the yield of this variety over that of the controls. In 1942, rainfall during the growing season was much heavier. Earliana proved to be extremely susceptible to infection, and the yield of marketable fruit produced by it was very low. All the fungicides gave significant increases in yield with this variety over the untreated controls, but in general the degree of disease control on Earliana was unsatisfactory. The yields of Pritchard and Marglobe were considerably greater than in 1941, and all the treatments largely increased the amounts of marketable fruits from these two varieties. Bordeaux mixture was significantly better (5 per cent. level) than the other materials in increasing yields.

Bordeaux mixture delayed fruit maturity in every instance, as compared with the other treatments and the controls. This delay was most marked with the two later varieties, and was only slightly noticeable with Earliana in 1942.

In both seasons, the treatments markedly increased the percentage of No. 1 grade fruits. In 1941, the increase averaged about 10 per cent. for all varieties, whereas in the rainy season of 1942 it was about 30 per cent. for Marglobe, 25 per cent. for Pritchard, and 3 to 5 per cent. for Earliana.

It is concluded that the yield and quality of marketable tomatoes in south-western Virginia can be greatly increased by four to six applications of a copper fungicide. Copper oxide and tribasic copper sulphate applied as dust or spray markedly control leaf blight, but are less effective than Bordeaux mixture in a rainy season. Bordeaux delays the date of the harvest peak of fruit to a much greater extent than copper oxide or tribasic copper sulphate. Control in a season favouring infection, is more difficult on early than on late varieties.

Henderson (R. G.). **Further testing of copper fungicides for control of Tomato blight in southwest Virginia.**—*Phytopathology*, xxxv, 2, pp. 120–128, 2 graphs, 1945.

The results of experiments in south-west Virginia from 1940 to 1942 [see preceding abstract] showed that tomato early and late blights (*Alternaria solani* and *Phytophthora infestans*) and leaf spot (*Septoria lycopersici*) could be effectively combated by tribasic copper sulphate and cuprous oxide either in liquid or dry form. In 1943 further tests were carried out to determine the comparative efficiency of these two compounds in the latter more practicable and convenient state. Six applications of yellow cuprous oxide (4·1 per cent. copper) at the rate of 40 to 50 lb. per acre gave about 10 per cent. higher yields than comparable treatments with tribasic copper sulphate (6 per cent. copper). Supplementary applications of sodium nitrate at dosages of 100 and 50 lb. per acre, respectively, on 7th and 20th July and 100 lb. on 3rd August, reduced the harvest of marketable fruit by 8 per cent. or so, possibly in conjunction with the abnormal drought of August and September. The cuprous oxide dust was also more effective than the tribasic copper sulphate in the prevention of foliar infection by *A. solani* in the greenhouse, the difference being partly due to the insufficient blending of the toxicant in the latter preparation with the talc diluent.

Wilson (J. D.). **Further observations on the control of Tomato anthracnose.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 226, pp. 56–63, 1944.

A paper by the author and H. A. Runnels recently noticed from another source [*R.A.M.*, xxiv, p. 209] gives later information concerning the most effective method of tomato anthracnose (*Colletotrichum phomoides*) control than that presented here. On the basis of the 1942–3 trials, the treatments recommended were five applications of fermate as a spray (2–100) or as a dust (10–90 talc), at ten-day intervals, the first to be made when the first-cluster fruits are about two-thirds developed.

Strong (F. C.). **A study of calcium chloride injury to roadside trees.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxvii, 2, pp. 209–224, 4 figs., 1944.

Since 1930, the writer has investigated many cases of injury to trees along gravel highways treated with calcium chloride as a dust palliative, the chemical accumulating in substantial quantities in impounded run-off waters. The damage generally assumed the form of mild to severe leaf scorch indistinguishable from that caused by drought. Of the 12 kinds of trees tested for their reaction to the presence of calcium chloride in the soil, balsam fir (*Abies balsamea*) and white spruce (*Picea glauca*) were the least tolerant of all, beech, hard maple (*Acer saccharum*), cottonwood (*Populus deltoides*), and aspen (*P. tremuloides*) the most susceptible of the hardwoods, and red and white oaks (*Quercus borealis* and *Q. alba*) and American elm (*Ulmus americana*) the most resistant.

In experiments on elm and white pine (*Pinus strobus*) seedlings, incipient leaf and needle scorch developed in the latter as a result of applications of calcium chloride to the soil at the rate of 4 oz. per sq. yd. and increased in severity up to the maximum rate of 4 lb., at which damage to the former was only of moderate extent. Sodium chloride was even more toxic.

At the higher concentrations, the symptoms of calcium chloride injury are more distinctive and less liable to confusion with those due to drought, the leaves or needles turning pale green rather than brown, becoming dry and brittle, and being prematurely shed in the case of the hardwoods. Applications of calcium chloride and dust mixtures to the leaves induced a typical brown spotting but no scorch.

Improved methods of highway construction have greatly lessened the frequency of calcium chloride injury to roadside trees.

Crandall (B. S.), Gravatt (G. F.), & Ryan (Margaret M.). **Root disease of Castanea species and some coniferous and broadleaf nursery stocks, caused by Phytophthora cinnamomi.**—*Phytopathology*, xxxv. 3, pp. 162–180, 2 figs., 1 map, 1945.

Phytophthora cinnamomi, which the authors, in agreement with European authorities and C. M. Tucker in the United States, keep separate from *P. cambivora* [*R.A.M.*, x. p. 755; xviii. p. 825, *et passim*], has been found to cause a root rot similar to chestnut ink disease on the American chestnut (*Castanea dentata*) in Maryland, Virginia, North and South Carolina, Georgia, Alabama, Tennessee, and Mississippi, on *C. ozarkensis* in Arkansas, on *C. pumila* in South Carolina, *C. crenata* in Louisiana, and *C. alabamensis* in Alabama.

On seedlings the fungus causes a loss of green colour of the foliage, followed by wilting in the broadleaf species and die-back in the conifers. On older nursery stock the symptoms do not appear in the aerial parts until the root is almost completely rotted.

On coniferous stock the fungus causes a dry type of root rot, accompanied by resin depositions on and in infected portions, including the wood. On broadleaf trees the rot produced is dry except on *Robinia* and *Juglans*. It is usually reddish-brown, but as in the case of conifers is mottled brown and light green in recently invaded tissue. On both conifers and broadleaf species no line of demarcation is found between invaded and healthy tissue, the fungus advancing into the sound tissue in irregular wedge-shaped streaks. The fungus often appears to attack just below soil-level, its presence in above-ground tissues being indicated in conifers by an external resin flow and in broadleaf trees by a depressed area above the dead cambium.

The disease is thought to be responsible for the recession of the American chestnut from the lower Piedmont area of the Atlantic States into the upper mountain altitudes, and from southern Mississippi and Alabama into the hilly northern regions of those States. A similar movement of *C. ozarkensis* is definitely attributable to the ravages of *P. cinnamomi*, the pathogenicity of which was demonstrated on its native hosts, the European chestnut (*C. sativa*), *C. alnifolia*, *C. ashei*, *C. margaretta* var. *arcuata*, *Lithocarpus densiflorus*, and the oaks *Quercus alba*, *Q. borealis*, and *Q. montana* [ibid., xvi. p. 73]. Black walnut did not contract infection in these tests with isolates of *P. cinnamomi* from chestnut, but subsequent experiments with walnut strains gave positive results. Russian chestnuts from the Caucasus, grown from seed supplied by Dr. N. I. Vavilov in 1933, proved to be equally susceptible to the root disease with other forms of the European chestnut, and were further attacked to a moderate extent by *Endothia parasitica*. Both in greenhouse and field trials the Asiatic species *C. crenata*, *C. mollissima*, *C. henryi*, and *C. sequinii*, proved highly resistant to *P. cinnamomi* remaining in plots in infested soil for periods of 5 to 11 years, whereas *C. sativa* succumbed after one or two.

P. cinnamomi was further shown to be the agent of a similar root disease on 20 hard- and softwoods in nurseries in Arkansas, Delaware, Georgia, Louisiana, Maryland, North Carolina and Virginia, the most susceptible species being *Pinus resinosa* [ibid., xiv. p. 409], *Taxus cuspidata*, yew (*T. baccata*), *T. media*, larch (*Larix decidua* and *L. leptolepis*), walnuts (*Juglans nigra* and *J. regia*), oak (*Q. borealis*), *Rhododendron mucronulatum*, and birch (*Betula papyrifera*). In greenhouse inoculation tests, 20 isolates from 16 hosts in seven States were found to be capable of inducing the root disease on *P. resinosa* and European chestnut, and are therefore assumed to be identical. In these experiments isolates from *C. pumila*, *J. nigra*, *P. resinosa*, and *T. cuspidata* were severely pathogenic to Douglas fir (*Pseudotsuga taxifolia*).

No control measures, except those based on general sanitary practices, have yet been devised against the root rot.

Phytophthora cambivora as well as *P. cinnamomi* is stated to be present in the United States.

PORTER (C. L.). **A leaf spot of Ginkgo biloba.**—Abs. in *Proc. Ind. Acad. Sci., 1943*, liii, pp. 78–80, 1944.

Each summer since 1939, *Ginkgo biloba* trees at Purdue University, Indiana, have been severely attacked by a leaf spot tentatively attributed to *Phyllosticta ginkgo*, which produces on the foliage irregular, ashen areas with dark reddish-brown borders, often originating at the margin and sweeping inwards towards the petiole. Older lesions commonly bear a few dark-coloured pycnidia. The fungus appears to secrete exotoxins which impart a golden-yellow tinge to the tissues not immediately involved by the blight. The fruits may also be spotted. The parenchyma cells are the first to collapse, followed by the palisade layer, while the epidermal tissues retain their normal aspect until the final stages of the disease are reached, the heavily cutinized protuberances of the lower epidermis in particular remaining visible and intact after the complete disintegration of the other tissues. The vascular bundles are little affected. The leaf spot is not sufficiently serious to impair the vitality of the host, but it does detract from the charm of a tree which has hitherto enjoyed the reputation of freedom from fungal parasites.

MARTIN (J. F.). **Spread of White Pine blister rust during 1944.**—*Plant Dis. Reptr*, xxix, 7, pp. 194–196, 1945. [Mimeographed.]

The most interesting facts in connexion with the spread of white pine blister rust (*Cronartium ribicola*) in 1944 were the detection of infected trees in five new counties in north-eastern Iowa, a 65-mile southward extension of the disease on *Ribes* in California [*R.A.M.*, xxiii, p. 122], the discovery of the rust, also on *Ribes*, in Yellowstone National Park [Wyoming], and on *Pinus flexilis* in its natural range.

JACKSON (L. W. R.). **Root defects and fungi associated with the little-leaf disease of Southern Pines.**—*Phytopathology*, xxxv, 2, pp. 91–105, 3 figs., 1944.

Southern pines, particularly shortleaf (*Pinus echinata*) and to a lesser extent loblolly (*P. taeda*), Virginia (*P. virginiana*), pitch (*P. rigida*), and (occasionally) longleaf (*P. palustris*), suffering from the serious deterioration and dying-off known as 'little leaf' in the Piedmont region of several southern States and in the upper coastal plain of Alabama are characterized by yellowed needles, shortened twig internodes, reduced diameter growth, and a progressive die-back of the crown from the base upwards [*R.A.M.*, xx, p. 330 and next abstract]. A comparative examination of the root systems of three healthy and four diseased shortleaf pines revealed in the latter die-back of the feeding roots, dead primary and lateral roots, pitch cankers on the larger roots, and excessive exfoliation of the bark on the smaller ones, known as 'brown patch'. The last-named in a less conspicuous form is a normal feature of healthy trees also. The significance of the pitch cankers, which were present in some degree on healthy roots, cannot at the moment be conclusively assessed. Sound and diseased individuals did not differ perceptibly in the gross morphology of their root systems or in their mycorrhizal provision.

Associated with newly formed brown patches on both healthy and diseased pines was a new species of *Torula*, to which the name *T. marginata* is assigned. It differs from the closely related *T. ligniperda* [ibid., ii, p. 34] in its larger conidia (12 to 13 by 11 to 12 μ), borne on longer chains of 2 to 12, mostly 6, and a more compact and faster-growing mycelium with a sharply defined margin. A strain of *Poria cocos* [ibid., iii, p. 376; xxi, p. 396] isolated from sclerotia ('tuckahoes') on the roots of diseased trees differed in several respects from the published

descriptions of the fungus, notably in the formation of chlamydospore-like cells, fragrance of the mycelium on cooked wheat, and the development on potato dextrose or 2 per cent. malt agar of a dark brown mutant, arising from the crossing of different isolates but not of different cultures of the same isolate. Inoculated into two-year-old short-leaf pine seedlings, both *P. cocos* and *T. marginata* induced brown patches and wood infections, the action of the former being more rapid and its symptoms more virulent than was the case with the latter. In one series of tests, for instance, the number of plants killed in 12 to 90 days by three isolates of *P. cocos* ranged from 79 to 100 per cent., the corresponding figures for three of *T. marginata* being 185 days and 75 to 83 per cent., respectively. Comparable results were obtained in other experiments. The relative pathogenicity of the two fungi was not markedly affected by the addition of humus to the soil.

Hepting (G. H.). **Reserve food storage in Shortleaf Pine in relation to little-leaf disease.**—*Phytopathology*, xxxv, 2, pp. 106–119, 2 graphs, 1945.

Quantitative analyses were made of the food reserves in the bark and wood of normal shortleaf pines (*Pinus echinata*) in comparison with those suffering from little leaf [see preceding abstract]. The root and trunk investigations covered an entire year, but the foliage was examined only once, in April, 1943.

The normal roots contained a minimum reserve in the autumn and a maximum of three times the minimum in the early spring. In the stems, the peak was between April and June. In healthy trees the reserve averaged about twice as much in the root bark as in that of the stem. In a normal root section 1 in. in diameter, an average of 68 per cent. of the reserves is in the bark.

The root bark of little-leaf trees contained an average of less than half as much food as that of healthy ones, and sometimes hardly any. On the other hand, the little-leaf stems were as well supplied with nutrients as normal ones. The average needle of diseased trees cut in April contained only 41 per cent. as much elaborated food as a comparable specimen from adjacent healthy ones, while the total foliated parts of the former were estimated to have a reserve food content less than 10 per cent. of the normal. In two roots from each of the same trees used in the foliar analyses the reserves of those affected by little leaf were only 33 per cent. of the normal.

A low synthesis of carbohydrates appears to be the reason of the decline symptoms in diseased pines, and the roots, which normally store larger quantities of food than the stems, and fluctuate more with seasonal changes, naturally suffer most from the malnutrition associated with little leaf. A remarkable effect of the root starvation is the accentuated formation of rough bark owing to the cork cambium cutting deeply into the food-storage region of the phloem. Less storage tissue thus remains in the root bark, and less accommodation is required for food on account of reduced synthesis. The excessive storage tissue is apparently cut off by cork cambium in process of deterioration as a result of starvation.

Lysaght (J. F.). **Regeneration of clear felled Insignis Pine at Whakarewarewa State Forest, Rotorua.**—*N.Z.J. For.*, v, 1, pp. 19–26, 1942–1944.

In the Rotorua district and elsewhere in New Zealand, hundreds of acres of *Pinus radiata* are being clear-felled annually, and the important problem of re-establishment urgently requires attention. In this connexion it is of interest to note that *Armillaria mellea* [*R.A.M.*, xvii, p. 714] was widespread in the stand before felling and has killed some of the replacements, usually at the age of two to three years, but in no case have more than 3 per cent. of the trees in any plot succumbed.

Plakidas (A. G.). **Blight of Oriental Arborvitae.**—*Phytopathology*, xxxiv, 3, pp. 181–190, 3 figs., 1945.

The agent of the blight of oriental arborvitae (*Thuja orientalis*) in the southern United States already described [*R.A.M.*, xxiii, p. 195] has been shown to be a new species of *Cercospora*, herein designated *C. thujina*. It is characterized by densely fasciculate, flexuous, sparsely septate, yellowish-brown, plurigeniculate conidiophores, 26 to 105 by 3·3 to 5 (average 55·8 by 4·3) μ, and oblong, tapering, straight to slightly curved, basally obconic-truncate, faintly echinulate conidia, 19 to 56 by 4·9 to 6·6 (42·2 by 5·5) μ, with 1 to 7 (4·2) septa.

Inoculation experiments with ascospore isolates of a *Mycosphaerella* often observed either accompanying *C. thujina* or alone on diseased leaves and branches gave negative results, indicating that the former organism is unrelated both to the *Cercospora* and the blight.

In a small-scale spraying test in 1943, the progress of the disease was completely arrested by four applications between 15th June and 3rd September of 4–4–50 Bordeaux, copper oxide (cuprocide) at the rate of 3 lb. in 100 gals. water, or basic copper sulphate (tribasic) at a dosage of 6 in 100.

Spaulding (P.) & Hansbrough (J. R.). **Decay in Balsam fir in New England and New York.**—*Tech. Bull. U.S. Dep. Agric.* 872, 30 pp., 5 graphs, 1944.

The data resulting from the dissection of over 1,100 balsam fir (*Abies balsamea*) trees 40 years old and upwards from eastern Maine, northern New Hampshire, and the Adirondacks, New York, have been analysed to show the relation of cull to age, diameter, site factors, and growth rates. Decay sufficiently severe to cause cull affected half the trees at 72 and all at 165 years. About a quarter of the total volume of all the trees was culled, principally in consequence of three rots, namely, top (*Stereum sanguinolentum*), brown butt (*Polyporus balsameus*), and white stringy (*Poria subacida*), the percentages caused by each being 54, 13, and 28, while miscellaneous fungi and form defects constituted the remainder. The butt rots appeared when the trees were about 40 years old, were present in half the number examined at 72, and caused some cull in half at 105. Top rot began at 40, was present in one-fifth of the trees at 90, and was usually responsible for much more cull than the butt rots, though the latter, when assuming a severe form, weakens the trees and renders them liable to windfall. At the age of about 70, in fact, decay from this source is of major importance in determining the correct rotation for the balsam fir.

On a volume basis, cull losses among the trees investigated were almost identical on good and poor sites, but calculated by percentage, the losses were higher on the latter. On a volume basis, cull was less in slow- than in fast-grown trees, whereas on a percentage it was much more nearly equal. The net periodic growth of fast-grown trees, after deducting decay cull, exceeded that of the slow-grown specimens by a ratio of 4 : 1 up to 70 years, when the difference began to drop. Extreme suppression, resulting in flat-top form, favours infection by *S. sanguinolentum*.

In the management of balsam fir for pulpwood, the writers recommend the immediate harvesting of merchantable stands which are largely over-mature and highly defective, to prevent further heavy loss. Having regard to cull from decay and windfall, the best cutting age appears to be about 70, with 80 as a maximum, by which time an average diameter of 8 to 9 in. is attained in unmanaged stands: these measurements may be substantially increased by appropriate silvicultural measures promoting the maintenance of a uniform growth rate, e.g., weeding and the girdling of dominant worthless hardwoods in young stands. The maximum cutting cycle should be about 20 years to obviate excessive intervening losses.

Englerth (G. H.) & Isaac (L. A.). **Decay of Western Hemlock following logging injury.**—*Timberman*, xlv, 8, pp. 35, 56, 2 figs., 1944.

Since logging 12 years earlier, over half the western hemlock [*Tsuga heterophylla*] trees (mostly under 25 in. in diameter) in a reserve stand near the Wind River Experimental Forest, Oregon, were found on dissection to have developed injuries through nearly all of which wood-rotting fungi had entered [*R.A.M.*, xxii, p. 231]. *Fomes annosus* was the predominant agent of decay, the other organisms concerned being *Poria colorea*, *P. subacida*, *F. applanatus* [*Ganoderma applanatum*], and *F. pinicola*. The disorganization extended for an average of 2·4 and a maximum of 8 ft. vertically beyond the scar, and penetrated to average and maximum depths of 4·8 and 12 in., respectively.

Darley (E. F.) & Christensen (C. M.). **The culture designated Madison 517 identified as Polyporus tulipiferus.**—*Phytopathology*, xxxv, 3, pp. 220–222, 1 fig., 1945.

Cottonwood (*Populus deltoides*) and hackberry (*Celtis occidentalis*) sections were inoculated in August, 1943, by a recently described method [*R.A.M.*, xxii, p. 380], with a culture of Madison 517 [ibid., xvii, p. 5] and one of *Polyporus tulipiferus* isolated from a sporophore on a wound on the latter host at St. Paul, Minnesota. Two to five months later, the sections were placed under a greenhouse bench at 85° F. and watered occasionally. On the appearance of fruit bodies, water was dripped continuously on the pieces of wood until the attainment by the sporophores of full maturity, which occurred to a considerable extent in August, 1944. Macroscopically, the fruit bodies of both isolates were typical of those produced by *P. tulipiferus* in nature, being resupinate to effused-reflexed, the upper surface white, villose, and faintly zonate, and the lower one furnished with irregular, daedaloid pores disintegrating into concentrically arranged teeth. Sporophores formed by Madison 517 were identified by L. O. Overholts as *P. tulipiferus*. The average (of 60) spore dimensions of Madison 517 were 5·2 by 2·8 with a range of 4·1 to 6·5 by 1·9 to 3·5 μ, the corresponding figures for *P. tulipiferus* being 4·9 by 2·8 and 3·7 to 6·4 by 2·3 to 3·3 μ, respectively. The average diameter of 25 basidia from each sporophore was 5·2 μ with ranges of 4·7 to 5·9 and 4·7 to 5·2 μ for Madison 517 and *P. tulipiferus*, respectively. The hymenia of the fruit bodies of both isolates contained an abundance of the encrusted cystidia characteristic of *P. tulipiferus*, protruding up to 30 μ beyond the basidia.

The evidence here presented is regarded as conclusive proof of the identity of Madison 517 with *P. tulipiferus*.

Findlay (W. P. K.). **Some factors influencing the rate of decay in wood.**—*Chem. & Indust.*, 1945, 7, p. 55, 1945.

In this paper, delivered at a joint meeting of the Society of Chemical Industry (Food Group, Microbiological Panel) and the Society of Agricultural Bacteriologists on 10th January, 1945, the available information containing the factors affecting the rate of fungal decay in wood are briefly summarized. The three factors discussed are the species of fungi involved (brown and white rots); physical condition of the wood, especially its moisture content (optimum 35 to 45 per cent. in most cases) and temperature (usually about 30° C.); and relative susceptibility of different kinds of timber, largely associated with the presence in the wood of extractives toxic to the invading organisms. Preliminary experiments have shown that the considerable variations in resistance that may occur within a single lot of a durable species, such as western red cedar [*Thuja plicata*], are related to the concentration of the toxic extractive in the different parts.

Rennerfelt (E.). **The growth of some putrefactive fungi on mechanical wood pulp.**—*Svensk bot. Tidskr.*, xxxvi, pp. 301–311, 1942. [Abs. in *Chem. Abstr.*, xxxviii, 13, p. 3469, 1944.]

Mechanical wood pulp was inoculated with 20 different species of fungi, of which only a few, such as *Fomes annosus*, *Lenzites betulina*, and *Polyporus vaporarius* [*Poria vaporaria*] (Eberswalde), attacked the material to any marked extent, causing brown discoloration and loss of weight (19 to 25 per cent.) [*R.A.M.*, xxiii, p. 506]. The action of *Lentinus abietina* and *L. lepideus*, on the other hand, was barely noticeable. The effects of the fungi on the wood pulp are more pronounced if ingress is gained parallel to the pulp sheet than if a perpendicular route is followed. Pulp from eight wood pulp plants showed variations of 12 to 25 per cent. loss of weight as a result of inoculation with *Polyporus* [*Polystictus*] *versicolor*, samples put through a hydraulic press being attacked more rapidly than those subjected to kamyr-drying.

Hirt (R. R.) & Lowe (J. L.). **Poria microspora in house timbers.**—*Phytopathology*, xxxv, 3, pp. 217–218, 1 fig., 1945.

Poria microspora has been found at Syracuse, New York, causing extensive decay in a new house built with the poorly seasoned timber commonly employed for such purposes under war-time conditions. The dull white fruit bodies, 3 mm. thick, of a dry, soft-papery texture, developed on the rotting pine sheathing boards after about a year in the decay cellars at the New York State College of Forestry. The tubes attained a length of 8 mm. on a sloping surface, with 2 to 2·5 pores per mm. The subiculum hyphae are provided with numerous clamps. The smooth, hyaline, oblong to oblong-ellipsoid spores measure 5 to 6 by 2·5 to 3 μ. These microscopic characters serve to distinguish *P. microspora* from the otherwise similar *Trametes serialis* [*R.A.M.*, xxii, p. 506]. Fructifications appear to be very seldom produced by the former organism, having been reported only from three widely separated localities in Canada and the United States. Infected wood has been demonstrated over a still larger area by cultures from Sitka spruce [*Picea sitchensis*] and Douglas fir [*Pseudotsuga taxifolia*] imported into Great Britain from Canada, and from the latter in Oregon and at Toronto.

Amadon (C. H.). **Ground line treatment of standing poles.**—*Bell Lab. Rec.*, xxii, 11, pp. 468–471, 4 figs., 1944.

In 1935, a total of 428 chestnut and northern white cedar [*Thuja occidentalis*] poles and posts were treated against microbiological decay at the vulnerable section, i.e., from a few inches to 12 or 15 in. below the ground-line, with a number of preservatives, of which sodium fluoride and a mixture of creosote and coal tar have proved particularly effective. The first step is to distribute 1 lb. sodium fluoride against and around the pole at the bottom of the excavation, which is then filled loosely with soil to ground-level and a trough formed round the pole by pressing the soil away from it to a depth of 10 in. With any convenient container, such as a watering can, with the sprinkler head removed and the tip of the spout flattened to pour a fan-shaped stream, 1 to 1½ gals. creosote is applied to the pole about 18 in. above ground-level. After a brief interval, the saturated soil is pressed back against the pole and back-filling is completed. A final application of ½ gal. may be given in areas where the presence of creosote on the surface of the soil is not objectionable, the liquid being poured into a shallow trough round the pole. It is estimated that this treatment will increase the service life of the poles by six years or so. It has been adopted by several of the Bell Telephone System's operating companies, one of which, in Canada, has already treated 258,000 northern white cedar poles out of 450,000 remaining in its lines.

Theden (G[erda]) & Schulze (B.). **Untersuchungen über die Bedeutung von Netzmitteln für die Schutzbehandlung von Holz mit wässerigen Lösungen.** [Investigations on the importance of wetting agents in the protective treatment of wood with aqueous solutions.]—*Holz Roh-u. Werkstoff*, vi, 8–9, pp. 241–245, 1 fig., 1 graph, 1943.

A tabulated account is given of experiments on coniferous sap- and heartwood at the National Material Testing Station, Dahlem, Berlin, to determine the utility of various wetting agents as adjuvants to aqueous timber preservative solutions [*R.A.M.*, xxii, p. 109]. Not only was there no improvement in the extent of penetration and absorption as a result of the admixture, but in some cases a slight and probably unimportant obstruction to the passage of the fluid was observed.

White-Stevens (R. H.) & Wessels (P. H.). **Studies in the minor element nutrition of vegetable crop plants: I. The interrelation of nitrogen, phosphorus, potash, and boron in the growth of Rutabagas.**—*J. Amer. Soc. Agron.*, xxxvi, 11, pp. 903–921, 1944.

At the Long Island Vegetable Research Farm, Riverhead, New York, boron deficiency has been found to develop in the field even when borax applications of the prescribed magnitude have been made, the differential degrees of the trouble observed on susceptible crops being associated with, and apparently dependent on, the nitrogen, phosphorus, and potash fertility levels employed. The results are presented of a greenhouse factorial experiment on Long Island Improved rutabaga [swede: *R.A.M.*, xxii, p. 38], involving the application of nitrogen, phosphorus, potash, and boron at high and low levels, the former, in the case of the first three elements, corresponding to the concentrations used in Shive's best solution and the latter to one-tenth of this strength, while for boron the amounts were 10 and 0·1 p.p.m., respectively.

Nitrogen, phosphorus, and boron all promoted root at the expense of foliar growth, potash and boron each amplifying the nitrogen effect. Boron, nitrogen, and phosphorus, in descending order, gave significant control of boron deficiency, whereas the action of potash in this respect was definitely deleterious. Nitrogen interacted with phosphorus to enhance the deficiency and with potash and boron to reduce it. Phosphorus interacted with potash and boron to reduce the deficiency. Nitrogen, phosphorus, and potash mutually intensified deficiency symptoms, but phosphorus, potash, and boron reciprocally reduced them.

Palti (J.). **Seed-borne vegetable diseases.**—*Hassadeh*, xxv, 2, pp. 51–53, 1944. [Hebrew.]

Alternaria spp., probably including *A. solani*, are responsible for a troublesome blight of tomato leaves, stalks, and fruits over a wide area of Palestine, the winter crop being chiefly affected. Healthy seed may be procured from summer crops thoroughly sprayed with copper fungicides, the most favourable location for this purpose being Upper Galilee. Plots affected by tomato bacterial blight (*Xanthomonas vesicatoria*), a relatively rare disease, should be excluded as sources of seed supply.

Black rot of cabbage and cauliflower (*Pseudomonas* [*X.*] *campestris*) causes enormous losses, especially in the coastal plain. It is largely soil-borne, and from preliminary trials does not appear likely to penetrate into the seeds of cauliflower plants showing foliar symptoms only. Seed crops of cabbage and cauliflower should, as far as possible, be raised in the Jordan and Esdraelon Valleys, where the disease is mild or absent; in slightly infected plots all plants showing signs of head rot should be rogued.

Leach (J. G.) & Smith (P. G.). **Effect of seed treatment on protection, rate of emergence, and growth of garden Peas.**—*Phytopathology*, xxxiv, 3, pp. 191–206, 1 fig., 2 graphs, 1945.

A tabulated account is given of investigations carried out in 1942 and 1943 at the California Agricultural Experiment Station to determine the relative protective values of several commercial fungicides and their effects on the emergence rate, growth, and yield of some leading pea varieties [*R.A.M.*, xxiii, p. 511].

In soil artificially infested with *Pythium ultimum*, semesan and yellow cuprocide conferred somewhat superior protection to arasan, new improved ceresan, and spergon, but the differences were not appreciable and all five preparations produced much more prolific stands of Laxton's Progress than those in the untreated control plots. For instance, in 1942, emergence in the treated plots ranged from 51·1 (0·2 per cent. arasan) to 92·2 per cent. (0·2 per cent. yellow cuprocide and 0·3 per cent. semesan), the disease index from 11·4 (semesan) to 63·6 (arasan), and the average weight per seedling (with cotyledons) from 1·35 (arasan) to 1·76 gm. (semesan), the corresponding figures for the checks being 5·6 per cent., 97·8, and 0·68 gm., respectively. In 1943, emergence in the treated plots ranged from 66·7 (0·2 per cent. spergon) to 78·7 per cent. (0·2 per cent. yellow cuprocide), the disease index from 28·3 (yellow cuprocide) to 44·7 (spergon) and average weight per seedling from 1·56 (0·2 per cent. arasan) to 2·16 gm. (yellow cuprocide), the corresponding figures for the checks being 17·3 per cent., 88, and 0·84 gm., respectively. In a single test with '604' (2, 3, dichloro-1, 4-naphthoquinone) [ibid., xxiii, p. 265] at dosages of 0·2, 0·1, and 0·05 per cent., the emergence percentages were 79, 67, and 54 per cent., respectively, compared with 47, 82, and 11 per cent. for spergon (0·2 per cent.), semesan (0·25), and control, respectively, indicating a satisfactory degree of toxicity to *P. ultimum* in the new preparation.

In similar trials in pasteurized soil inoculated with a strain of *Rhizoctonia* [*Corticium*] *solani* causing damping-off of sugar beet and beans [ibid., xxiv, p. 261], no seed decay or pre-emergence damping-off occurred on peas. None of the treatments effectively combated post-emergence epicotyl infection or cotyledon rot.

In field experiments with light or moderate infestations, principally of *P. ultimum*, all the chemicals gave adequate protection, but in some of the tests spergon and semesan proved more beneficial than yellow cuprocide or new improved ceresan, largely owing to the freedom of the two former from any deleterious effects on the plants (Laxton's Progress and Wisconsin Sweet). No evidence of chemical stimulation, as distinct from fungicidal protection, was afforded by these experiments.

Weimer (J. L.) & Luttrell (E. S.). **A canker of Cowpea and Macrophomina leaf spot of Cowpea and Snap Bean.**—*Plant Dis. Reptr*, xxix, 4, pp. 127–129, 1945. [Mimeographed.]

A disease of cowpea termed stem canker caused the death of a considerable number of plants at the Georgia Experiment Station in September, 1944. The early stages were not found, but the plants available showed brick-red cankers ranging from a few mm. in diameter to practically the entire length of the stem. Infection may apparently take place anywhere on the petiole or stem so that branches only or the entire plant may be killed. A species of *Colletotrichum* with curved spores, possibly *C. caulicola* Heald & Wolf, was thought to be the agent, though a species of *Fusarium* and one of *Phomopsis* (probably *Diaporthe sojae*) were also frequently found.

Following a rainy period in September, many leaflets of an unknown cowpea variety were observed to die off from the tip towards the base. All the tissue, including the veins, appeared to be affected, becoming light brown or grey. The adjacent tissue was somewhat water-soaked and the dead grey part of the leaflet

filled with pycnidia of a fungus identified as *Macrophomina phaseoli*. Cultural studies bore out this diagnosis but inoculations were not performed. The infected leaflets soon fell off and the infection did not spread to the stems. Two weeks after the outbreak was first seen no signs of the disease could be found. Similar infections occurred on potted cowpea plants in the greenhouse, the fungus entering the stem through the petioles and killing the entire plant.

Snap beans in the greenhouse showed the typical symptoms of infection by *M. phaseoli*. In a field at Tifton the plants had been weakened by drought, and during a period of wet weather infection appeared to spread from the leaflets to the stem and cause the extensive destruction. Isolations of pycnospores from the infected leaves produced the characteristic sclerotial stage of the fungus. The crop in the field was also attacked to a lesser degree by *Phyllosticta phaseolina*.

HARRIS (M. R.) & ELLETT (C. W.). **A Penicillium disease of Soybeans.**—*Phytopathology*, xxxv, 2, pp. 144–145, 1 fig., 1945.

A species of *Penicillium*, the identity of which has not yet been determined, was consistently isolated from two types of lesions on soy-beans [*R.A.M.*, xxiv, p. 265] undergoing germination percentage tests at the Ohio Seed Improvement Association in the winter of 1943–4. In some cases the cotyledons and hypocotyls bore sunken, irregular, dark brown spots, while in others the lesions on the hypocotyls were soft, water-soaked, and darkish, those on the cotyledons being similar but exceptionally large and often causing collapse of the entire organ into a soft, pale grey mass of rotted tissue. The inoculation of seeds with broth and agar cultures of the mould resulted in retarded germination, stunting of the seedlings, distortion of the leaves and reduction to half the normal size, and sometimes in the development of lateral buds, imparting an effect of fasciation. Numerous lesions comparable to those described above were formed on the hypocotyls and cotyledonary leaves of the infected plants, from which the pathogen was readily recovered in culture. The results of preliminary varietal susceptibility trials are tabulated.

WILSON (J. D.). **Ten years of Carrot spraying with various copper-containing materials.**—*Bi-mon. Bull. Ohio. agric. Exp. Sta.*, xxix, 226, pp. 63–73, 1 fig., 1944.

During the last ten years Bordeaux mixture and one or more of the fixed copper compounds have been used in spraying experiments against carrot leaf blights (*Cercospora apii carotae* [*C. carotae*] and *Macrosporium* [*Alternaria*] *carotae*) in Ohio [*R.A.M.*, xii, p. 356], where the incidence of these diseases has been increasing for the past 15 years. In 1939 some of the materials were also used in dust form. Small plots in randomized distribution were treated at ten-day intervals with formulae usually containing 1½ to 2 lb. copper (as the metallic equivalent) in each 100 gals. spray liquid. Carrots are somewhat susceptible to spray injury, the fixed coppers in particular tending to reduce yields in the absence of the leaf blights. Bordeaux mixture (8–8– or 6–6–100) consistently gave equal or superior control to any of the fixed coppers with which it was compared, being placed at the head of the list in seven out of 13 tests including both types of fungicide. The yield differences between plots treated with the several fixed coppers were seldom of significant magnitude, but in the case of tribasic the balance between disease control and host injury was generally more favourable than with the other materials. Cuprocide, for example, usually produced smaller harvests than the other fixed coppers on account of foliar injury and should probably be applied to carrots at lower concentrations than those recommended for Bordeaux or most fixed coppers.

Whenever 50 per cent. or more of the foliage had been destroyed by the leaf blights at the time of the last treatment, Bordeaux mixture and many of the fixed coppers would show a significant increase in yield. On the other hand, if defoliation in the check plots amounted to less than 10 per cent. at harvesting, the yields from the treated plants were usually lower, in some cases significantly so, than those from the controls, the differences being more marked on upland than on muck soils. In the 12 experiments in which the data warranted statistical analysis, the least significant difference in yields averaged about 10 per cent. of the harvest from the control plots. Moreover, the weight of the treated carrot tops was often two or three times heavier than that of the untreated, while crown rot (*Erwinia carotovora*) was usually less prevalent in the protected than in the check plots.

The admixture of wheat flour and other adhesives as adjuvants to carrot sprays appeared to be of doubtful value, and they were therefore omitted from many of the later trials, but wetting agents (mostly turgitol) were included throughout the experimental period. Cupro K and copper hydro 40 were finally discarded by reason of their general unavailability on the market and relatively high cost on the basis of metallic copper equivalent. Spraying was found to be rather more practical than dusting for the control of the carrot leaf blights, but further comparative experiments are necessary to establish a definite ruling in this sense. The very narrow margin between disease control and host injury in carrots is probably one reason for the superiority of Bordeaux over the fixed coppers at comparable dosages as a means of increasing yields. Fermate (3– and 2–100), used only in 1942 and 1943, gave satisfactory control of the two pathogens but caused mild foliar damage; sulphur proved ineffectual in the few tests made with it. It is inadvisable to reduce the copper content of carrot sprays below a metallic copper equivalent of 1½ lb. per 100 gals. There is little advantage in reducing the interval between spray treatments to less than nine days.

The leaf blights were adequately controlled by the lower (6–6–100) of the two above-mentioned Bordeaux formulae. A number of the fixed coppers with a 50 per cent. copper content may be used at a dosage of 3 lb. in 100 gals. The first application should be made when the tops are 4 to 6 in. high and repeated at 10-day intervals until a fortnight or so before harvesting.

Ark (P. A.). **Crater rot and blotch of Celery, a new aspect of soft rot caused by Erwinia carotovora.**—*Phytopathology*, xxxv, 2, pp. 140–142, 1 fig., 1945.

Besides heart rot [*R.A.M.*, vii, p. 218], *Erwinia carotovora* has been found to cause a destructive disease responsible for heavy losses in commercial celery fields in the Delta region of California. Small, watery spots, subsequently turning straw-coloured to brownish and later becoming sunken, dark brown, and sharply delimited, appear near the petiole bases. Sometimes the lesions are merely superficial, resulting in a blotchy appearance, in contrast to the deeper, soft, watery rot. Ultimately the infected tissues dry out and collapse into concave, crateriform depressions. Badly diseased plants are useless for export and the outer large petioles have to be stripped off. The practice of leaving infected stalks in the field causes heavy infestation of the soil with the crater-rot bacteria, and may account for the extension of the disease following repeated crops of celery on the same site.

Black stem and rust quarantine (quarantine No. 38).—U.S.D.A., B.E.P.Q., 4 pp., 1944.

A revision, effective as from 26th December, 1944, of the black stem rust quarantine No. 38 adds Washington to the list of States that are being protected against *Puccinia graminis* by restricting the movement thereto of susceptible species of barberry and *Mahonia*.